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JOHN A. HILL, President and Treasurer.
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FRED J. MILLER, Editor.

FRANK RICHARDS,
F. A. HALSEY,
EDWARD P. BUFFET, } Associate Editors.

Representatives of Business Department.
ANGUS BALLARD, for New England.
JOHN MCGHIE, for Middle States.
WILLIAM R. WALLIS, for the West.

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Government Manufacturing.

A contributor to the "Army and Navy Journal", who signs himself "Navy," gives in that journal some facts that go to show some of the features in which navy yard work differs so radically from similar work carried on in private establishments. Taking a typical navy yard he shows that in it each of the seven bureau chiefs at Washington has his representative at the head of a series of shops and storehouses, each with its foreman, instead of having one set of shops and one foreman. Thus, at one yard, there is a machine shop for ordnance, another for construction purposes, a third for the steam engineering department, a fourth for the equipment department, and a fifth for the yards and docks department. In all, he finds that one navy yard has sixty foremen where but thirteen are needed, and that twelve navy yards and stations have four hundred and fifty more foremen than are necessary. Counting in the clerks, draughtsmen, and quartermen who could be spared by a consolidation, "Navy" finds that $1,872,000 could be saved on labor alone. Adding the interest on moneys needlessly invested in duplicating machinery and shops and on renewals, he finds that $3,000,000 could be saved each year—"enough to build a battleship."

This, however, is indirect loss only besides which there is the loss by waste which results from several departments working at the same time without a controlling head to see that there is prompt and proper co-operation. It frequently occurs, for instance, that bulkheads have to be torn out after having been built, or that openings for the replacing of machinery are closed before the latter has been put back. The most ridiculous system of all is pronounced by "Navy" to be the method of guarding stores and material, under which a workman wastes endless time if he requires half a dozen screws. Furthermore, the stores are purchased by paymasters, who have no technical knowledge of the tools required, and as a result of these cumbrous methods thousands of dollars' worth of material had to be bought without warrant of law during the war with Spain.

Our plan for managing these troubles has been stated before, and that is to have a department of the government to be known as the "Department of Manufactures," the head of which should be a cabinet officer. This department should have especial charge of all that pertains directly to the interests of American manufacturers and should have direct and responsible charge of all the manufacturing or industrial establishments of the government from the bureau of engraving and printing to the arsenals in which shoulder and larger guns are made, as well as all navy yards, or at least those parts of them that are devoted to the construction or repair of naval vessels. We believe that the men to direct such work should be civilian and not military officers and that the military officers should have no direct authority over them or at least no power to interfere in any way with the work carried on by them. We believe that military officers should confine their efforts to the successful carrying on of purely military work, leaving that which is purely mechanical and industrial to be carried on by those who are better fitted for it and who, more important still, are not hampered by military red-tape and by usages which were all right in the time and for the army and navy of Alexander the Great but are utterly out of place in a twentieth century manufacturing establishment.

Trusts and Patents.

Under anti-trust laws corporate combinations which create monopolies are held to be illegal. But what if the monopoly is itself of a kind expressly sanctioned by law? A patent is such a monopoly—a just one, usually, but a monopoly none the less. A case bearing upon this question was recently decided in the United States Circuit Court. There were two companies which had purchased the right to manufacture stoves under a certain patent and had bound themselves to meet once a year to fix prices. One of these companies tried to disregard the contract, with the excuse that under the anti-trust law any combination to regulate prices was unlawful, and hence that the agreement was invalid. But the court, by Judge Adams, held that the companies which had purchased the right to use the patent must be regarded as one person and that they were entitled to all the privileges of the original patentee. If a number of persons owning distinct patents of similar nature had attempted to regulate prices, their action would have been illegal.

This opinion seems reasonable enough. If a statute has been passed to kill monopolies because they are bad, it can hardly be construed to affect such monopolies as are meanwhile fostered by law because they are good. The decision that the several holders of one patent act together as one person may furnish material for some discussion among legal theorists. It seems like an extension of the old "artificial person" idea upon which all corporations are founded. A celebrated case in New York which settled the illegality of genuine "trusts" seems to have given a back-set to the notion that the formation of artificial persons may be carried to the extent of compounding. The modern pseudo trusts evade this difficulty and only indirectly are combinations of former corporate bodies. But in the opinion of Judge Adams we seem to find the admission of a shadowy compound artificial person, who for one purpose at least may live and have his being.

Some of our contemporaries (foreign and home) are devoting a great deal of

space to the discussion of the awards of prizes at Paris. First, it is shown that we Americans received more prizes than the exhibitors of any other nation except France, and then it is shown that this is deceptive, because we had the largest number of exhibitors of any nation except France and got fewer prizes in proportion to the number of exhibitors. Big tables have been published and analyses given to show just how the various nations fared in all the different classes, and we cannot avoid thinking that this is all useless so far as machinery is concerned. We do not believe there are enough purchasers of machinery that would be in the least influenced by the awards of prizes, to make discussion of the subject worth while.

Legal Notes.

BY WM. MARSTON SEABURY.

ACT BEYOND SCOPE OF EMPLOYEE'S DUTY.

Agnes Allen was employed by William P. Hixson to feed a certain machine in Hixson's factory and it is to be presumed that it was her duty to inform the superintendent when the machine was out of order.

It seems that this employee did inform the superintendent of the defective condition of the machine and when she was thus employed she volunteered to assist the superintendent in ascertaining the precise extent and character of the derangement. In doing this she took hold of a certain cloth and her hand was drawn between a roller of the machine and a bar and injured. She brought suit in the City Court of Richmond County, Georgia, to recover damages for her injury, but the trial court rendered judgment against her and in favor of the defendant, from which she appealed.

The Supreme Court of Georgia affirmed the judgment of the lower court and went so far as to hold that the plaintiff was engaged to do a certain work and that although it was presumably her duty to notify the defendant's superintendent of any defects in the machine at which she was at work, she acted beyond the scope of her duty by attempting to show the superintendent the defects complained of and that, therefore, there could be no recovery.

The court said: "It follows that the master was under no duty of protecting her against injuries received while she was a mere volunteer, endeavoring to accomplish something entirely outside the scope of her employment. The act which caused her injury was certainly one of this kind; for in taking hold of the unwrapped cloth for the purpose of showing the superintendent the condition of the machine she volunteered to perform a service not required of her and therefore necessarily acted upon her own responsibility and at her own risk."

The plaintiff also contended that the defendant negligently allowed her hand and wrist to remain between the roller and bar and failed to effect her release promptly. As to this the Appellate Court said that, "When an employee, without fault on the master's part becomes placed in a dangerous or painful situation, the master is under no positive legal duty of exercising all reasonable care and diligence to effect such employee's speedy release. * * * The duty arising under such circumstances is one of humanity and for a breach thereof the law does not, as far as we are informed, impose any liability." (36 S. E. R., 810).

"La Lorraine," a new steamship of the Compagnie Générale Transatlantique, was open for the inspection of numerous guests at her New York pier, October 17. This vessel was built in the company's yard at Penhoët (St. Nazaire sur Loire), France, and sailed on her trial trip July 24, 1900, at which time she developed 22,118 horsepower, with 89.5 engine revolutions per minute, and attained a speed of 22.629 knots per hour. She is 580 feet long, 60 feet broad and 39.6 feet deep. Her displacement is 15,300 tons. She has six decks, sixteen transverse and one longitudinal water-tight bulkhead; two sets of triple expansion engines—eight cylinders; nickel-steel shafts; sixteen cylindrical return tubular boilers; sixty-four Morrison corrugated furnaces; two propellers 22 tons each, 21 feet 5 inches in diameter, three blades each. The propeller blades are of Stone's bronze and the hubs of cast steel. There are accommodations for 446 first class, 116 second class and 400 third class passengers. The interior is fitted up with the luxury that has become indispensable on up-to-date passenger vessels.

Commercial Review.

NEW YORK, Saturday, October 20.

THE MACHINERY TRADE.

Business is still under the hypnotic influence of the election, but some of the machine-tool houses report an improved tone. There is evidently an eagerness to be on deck as soon as business begins to move, so prospects for an active resumption of trade in November are bright.

A feeling of more confidence on the part of buyers has been noticed of late by the Nicholson File Company. There has been a good inflow of stock orders, denoting belief on the part of the trade in stability of prices and an impression that there will be a heavier demand before long.

An unusually important enterprise in the way of a private car works is that of the Pittsburgh Coal Company. This concern, it is reported, will found a plant at Montour Junction, Pa., and build about 300 cars a year for its own use, besides doing a still greater amount of repair work. The plant is to cover seven acres. It will be electrically driven for the most part. The buildings are to cost $60,000 and to be equipped with about $100,000 worth of machinery. Orders for the equipment, such as lathes and woodworking machinery, are now being placed, it is said. The main building, for car construction, will be 60x300 feet. An engine shed will adjoin it and be 45x125 feet. A brick car repair shop, 50x300 feet, will be erected also. In addition, there will be a power house 35x60 feet, a two-story office building 20x60 feet, and a record store building 23x33 feet.

The Auburn Ball Bearing Company has recently gone into business at Auburn, N. Y., with the following officers; Mark D. Knowlton, Rochester, president; Fred A. Wiggins, Auburn, vice-president; Harry G. Lattimer, Jr., Auburn, secretary; John E. Myer, Auburn, treasurer and general manager. Henry LaCasse, of Rochester, will be superintendent of the manufacturing department. Ball-bearing hubs and wheels for all kinds of motor vehicles will be a special feature of the business. The location is in the Crane building in Clark street. The special merits claimed for the "Auburn Ball Bearings" are that they distribute the load over many more of the balls than is usually done, and that their movement is a purely rolling one, so that they are frictionless and do not require lubrication. The distribution of the load enables the bearings to be employed for heavy work, it is said, such as on shafting or a trolley car.

ENGLAND OUR FIELD FOR TOOL EXPORTS.

An American tool representative who came in from abroad the other day confirmed the reports of dull business in Germany and Russia. He maintains that the great field of the future for our machine-tool builders is England. British shop men are beginning to wake up to the fact that they must adopt improved methods if they want to hold their own. They realize, for instance, that they are being surpassed by Germany in the character of her steamship service. The younger generation of machinery men are disposed to look with much favor toward American machines. In Halifax and other machine-tool using centers, one finds the old men conservative but the boys progressive. The work of building up our British trade, however, must be done by missionaries. The speaker was not of opinion that the greatest results are to be obtained through agencies. He disapproved in particular the arrangement where a British dealer undertakes to sell several American makes of machine of the same kind. He commended a certain house which will take the agency for only one of a class.

MACHINE TOOLS IN ARGENTINA.

Norbert B. Kates, of the firm of Kates & Bok, exporters at 56 Pine street, New York, who pay much attention to the export of machinery and tools to South America, has returned from a nine-months' trip to the Argentine and elsewhere. Speaking to a representative of this paper, he said in effect:

"There is a most excellent demand for machinery at present in the Argentine, although a boom there or in any South American country is not to be expected, since the Spanish-American temperament is deliberate and everything is for "manana." The country is far advanced in many respects. Some of the buildings in Buenos Ayres are as fine in their architecture and appointments as those in the best European cities. Many lines of manufacture are carried on there, including that of printing presses, macaroni machinery, tools and agricultural implements. There is consequently a demand for machine tools for this manufacturing work, as well as for repairs to equipments of mills of all sorts.

"Hitherto the machine tools used have been chiefly imported from Europe. I do not know of any American machinists in the country. In buying the tools it is reasoned that what is good enough for Europe ought to be good enough for South America. But the apparatus imported is of such a quality that the name 'hardware' would apply better than 'machine tools.' The gears, for instance, are cast, not cut. I argued in favor of American tools and explained that the European nations are buying about $5,000,000 worth yearly from us. We have succeeded in taking some good orders for tools, one of which is for the equipment of a shop in which power-transmitting machinery will be manufactured. A special pulley lathe is among the tools that will be installed. Formerly such work was done on an ordinary lathe. We have sold milling machines and rack and gear cutters in South America, which shows that the country is open to machine-shop progress.

"The monetary difficulties in the Argentine have been smoothed over by the establishment of a definite ratio of value between gold and the inferior currency. Brazil is the country where financial troubles now exist.

"As to the best method of doing business in the Argentine, it may be said that a number of English manufacturers work through a selling combination or joint agency which will handle only one brand of machine of a particular type. Some American manufacturers attempted a similar arrangement, but their representatives proved unscrupulous and brought them into discredit. Trade in the Argentine must be transacted through some one who knows the country."

The opinions of Mr. Kates on machine-tool prospects in South America are particularly interesting from the fact that he was one of the pioneer builders-up of the American machine-tool trade in Europe. He traveled there and introduced the standard machines of a Western firm at a time when builders had not waked up to the fact that aside from the semi-special product of certain old companies, there could be any European market for their tools.

BRIGHT MANUFACTURING PROSPECTS IN MEXICO.

R. H. Beach, of the General Electric Company, has just returned from a trip to Mexico. He is enthusiastic over the business opportunities in that country. Although it is the most prosperous of all the Spanish-American states, he says, it is as yet practically undeveloped industrially and the possibilities of development are enormous. Electricity has as yet been applied only to a small extent. The electric railway in Mexico City is the only one in the country, and that comprises only 30 out of the 200 kilometers of street railway in the town. Several of the cities have electric-light plants, and there are a number of electrical transmission systems for mining and for cotton mills. In Pueblo, 2,000 electrical horse-power are used in cotton mills, and about the same power for the same purpose in Guadalajara. But all this is trivial compared with what remains to be done.

Mexico is waking up, and it is a splendid field for an enterprising man to start out in upon almost any line of manufacture. Although money is plentiful there, and native capitalists would be glad to found industries themselves, they lack the practical knowledge. To this statement, cotton manufacture is an exception. In that line the country supplies practically all her own markets.

The profits obtainable upon manufactured goods in Mexico are extraordinary. A man who is selling a gasoline lamp with a Welsbach burner, made in one of our Western States and for which he pays $3.50, gets $30 (Mexican silver money) for it down there, and last year he made $17,000 out of the business. Another man who started out with practically no capital, to make ginger ale, is clearing $30,000 a year. It would pay to build carriages in Mexico. An ordinary brougham sells for $3,000. This, of course, is in Mexican currency, but the expenses of manufacture except on imported materials would be paid with the same medium. Labor is cheap, and the Peons or native workmen are excellent mechanics.

There is at present a limited field for machine tools because of the lack of industries for their use, but Mr. Beach thinks that the chances of profit for anyone who should start up a machine shop would be excellent. There would be more or less repair work from the cotton mills, and particularly a good outlook for a shop that went into some line of manufacture.

Immediately connected with Mr. Beach's trip is a street railway enterprise of Geo. S. Gandy, Philadelphia. It is a twenty-mile road to be installed in Guadalajara. The current will be derived from water power and be transmitted eight miles.

The present exports of the General Electric Company to Mexico amount to about $1,000,000 a year.

CINCINNATI REPORT.

In the Cincinnati field, nearness of election has dampened the ardor of the larger manufacturers almost imperceptibly. While the majority admit that their shops are just now in an uninteresting condition, all, without exception, view the situation optimistically.

With the Lane & Bodley Company, orders are for strictly standard work; principally for the Columbian Corliss engines, Cincinnati slide valve, and portable sawmills, transmission machinery and air compressors. This company reports a monotonous abundance of orders on their books, and almost without exception at the highest prices that have ruled during the past two years, and sufficient to keep them running full, well into the next year.

Export and domestic trade with the machine-tool men is acknowledged to be very light just at present. Jobbers as a rule have withheld their orders, which is not to be considered strange in view of the paucity of inducements. For the most part orders being placed now are for actual sales made. A number of larger Cincinnati firms report for the month of September and up to the present time this month an unsually large number of quotations indicating preparation for placing of orders as soon as election is over. The head of one of the largest Cincinnati concerns says he knows personally of a number of deals involving a good sized order of radial drills which are hanging fire until the result of the election is known.

Greaves, Klusman & Co., making iron and wood-working machinery, report marked improvement in their business during the past four weeks. Among other orders, they recently received one from their New York agent for four lathes destined for Spain. They report enough orders still on hand to keep their shop running full time for the next two months.

A local company manufacturing principally the higher grades of machine tools, including upright drills, report as many orders closed so far this month as in the past three months together. An official of this firm says the concern has orders for at least two months' work hanging fire absolutely subject to the outcome of the coming November incident.

Dreses, Mueller & Co. have received some substantial orders for several of their largest machines from Holland, in which part of Europe the company seems to have its best hold. Mr. Mueller is well pleased with his concern's Pacific coast representative, and says jobbers generally are very considerate and only seem to place orders as they have sales.

Secretary and treasurer John J. Hay, of the LeBlond Machine Tool Company, reports orders for October up to the 15th fully 25 per cent. greater than those of the entire month of September. The greater part of this volume was domestic in character. Mr. Hay says he has a memorandum of some very favorable inquiries which he fully expects to close di-

rectly after the election, dependent upon a certain outcome.

Taken as a whole, the proportion of local machine tool and allied lines business going beyond the limits of this country does not exceed 33⅓ per cent.

The Lane & Bodley Company is furnishing the Waltham Watch Company with a 26x30-inch air compressor, a second order. They are just starting up one 18 and 32x48 Cross Compound Columbian Corliss engine for the Simonds Manufacturing Company, of Chicago, and two heavy duty rolling-mill engines, one 16x36 inch and one 22x48 inch. The company is also just ready to start one 28x48-inch heavy duty, and one 26x48-inch heavy duty rolling-mill engine for the new mill of the Empire Rolling Mill Company, at Cleveland. A few days ago the company shipped a 20 and 36x48-inch Cross Compound Corliss air compressor with two-stage air cylinders 20 and 34x48, this being two of four on one order making about twenty carloads in the shipments.

CHICAGO MACHINERY MARKET.

One of the largest orders for power closed at Chicago recently was that of Armour & Co. for their central plant at the stock yards. This plant, electrically equipped, has been spoken of as perhaps the finest in the West, though not the largest. The present plant has four 1,000 horse-power engines purchased from the Filer & Stowell Company, and twelve 375 horse-power vertical water-tube boilers, aggregating, 4,500 horse-power, purchased from Wickes Brothers. These orders have duplicated the capacity of the plant, so that it will be increased to 9,000 horse-power. January deliveries are arranged for, and the work of enlargement of capacity will proceed at once. Wickes Brothers have also closed an order for ten 300 horse-power vertical water-tube boilers for the American Spirits Manufacturing Company, Peoria, Ill.

Conditions show little change from a month ago in the boiler and engine trade. Inquiries keep up, but once estimates are secured the prospective buyer usually places them in a recess in his desk and notifies the alert salesman that the matter will be taken up later. Not all negotiations end thus, but enough to give color to the market.

The activity that is thus noted in inquiries covers the usual range of the market, and in no particular respect is there noticed any dullness or lack of prospective activity. A comforting number of new enterprises are looking out for their equipment, and a corresponding amount of enlargement work is in progress. Replacements of power are also receiving full attention. Deliveries cannot be made promptly, and factories are reported to be generally busy, with work sold ahead anywhere from two or three to eighteen months.

Makers of gas engines say trade is fairly good. In a measure the trade is differentiating itself into classes, one maker catering especially to the farmer trade, another to the railroads, etc. Of these two classes the farmers are said to be buying the cheaper grades of engines, but are buying in steadily good quantities, the use of power in a small way becoming more general in the agricultural regions. The Weber Gas and Gasoline Engine Company says that business during October to date from the Chicago office has been greater than for the corresponding period in either August or September. They have recently been quite fortunate in the sale of engines for drum-hoist and tail-rope haulage in coal mines. The Otto Gas Engine Company reports business keeping up at about the same good pace as it has all the year.

The Heine Safety Boiler Company has sold two 300 horse-power boilers to the Rockford Edison Co., of Rockford, Ill.

EASTERN PENNSYLVANIA NOTES.

The Frankford Steel and Forging Company, Philadelphia, reports business in excellent shape, a steady demand for its forgings being maintained. It is especially busy in the crank-shaft department, and with the additional machine-shop facilities which it has, finished castings can be turned out with greater rapidity than before. In view of the sustained character of its business, it is probable that large extensions in its plant will be necessary.

Otto Gas Engine Works, Philadelphia, are very busy. Many of their engines are now going to isolated electric lighting plants, although their output finds a market in innumerable industries. In spite of the fact that gas engines are being built by so many manufacturers, the Otto people state that not only has the demand for their engines not fallen off, but it has shown a healthy increase, which has filled their shops, and will keep them busy for some time. They are now engaged in building a series of special engines for United States Government use.

Frederick H. Gliem & Co., Philadelphia, report encouragingly on the outlook of the new firm. They are now turning out two tool-room boring machines weekly, have just completed and shipped a rotary planer to the Westinghouse Machine Company, Pittsburgh, and have shipped a cold-saw to the Ferro Carbon Castings Company, of Frankfort, and another to the Norway Iron and Steel Company, of York, Pa. They are also about to bring out a line of new machinery for which there exists a large demand.

Thomas H. Dallett & Co., Philadelphia, report a slight falling off of orders for special tools, but no diminution in the number of inquiries and look forward to seeing these latter crystallize into orders after election. The special machinery for the Newport News Shipbuilding Company is about completed. The pneumatic chipping hammer which they make is catching on, as are the breast drills and other smaller tools, while the orders for their staple portable tools, that is, portable electric drilling machine, duplex boiler drilling machine, and other labor-saving tools, keep well up.

The Abrasive Material Company, Philadelphia, finds without difficulty enough work to keep its factory constantly busy, and an agreeable number of orders on the books ahead to ensure full working capacity for some time to come. The new factory added during the past year is a model of arrangement. It enables the Abrasive Material Company to turn out wheels rapidly in quantities to supply a demand which for several months has shown a gratifying increase. Mr. Louis I. Byers, manager, sees no reason to suppose that the demand will fall off very greatly during the next few months.

In the Franklin S. Miles plant, Philadelphia, no complaint of hard times is made. The demand for the special screws manufactured there continues, and the small, but well equipped shop is running full time and over.

J. G. Speidel's shop in Reading is working to the limit, and an extension has become necessary. He will probably build shortly a factory which will enable him the better to cope with the numerous orders that are coming in his direction. In addition to four travelling cranes for the Gould & Eberhardt works at Newark, he has a large number of domestic and foreign orders for elevators going through.

Quotations.

NEW YORK, Monday, Oct. 22, 1900.

Iron—American Pig, tidewater delivery:—

Pennsylvania Irons:	
No. 1 X foundry	$16 25 @ $17 25
No. 2 X foundry	15 25 @ 15 75
No. 2 plain	14 25 @ 14 75
Alabama Irons:	
No. 1 foundry, or soft	15 25 @ 15 75
No. 2 foundry, or soft	14 25 @ 14 75
No. 3 foundry	13 25 @ 14 25

Bar Iron—Base sizes—For good refined brands on dock, 1.40 @ 1.50c., and for same from store 1.65 @ 1.75c.

Tool Steel—Base sizes—Good standard quality, 7 @ 8c.; extra grades, 10 @ 14c.; special grades, 16c. and upward.

Machinery Steel — Base sizes — From store, 1.60 @ 1.80c.

Cold Rolled Steel Shafting—Base sizes—From store, 2¼ @ 2½c., according to quantity.

Copper—Lake Superior, ingot, in carloads, 16¾ @ 16⅞c.; electrolytic, 16½ @ 16¾c.; casting, 16½c.

Pig Tin—28¼ @ 28½c. for 5 and 10-ton lots, f. o. b.

Lead—For wholesale lots, 4⅜c., with .02½ @ .05c. extra for carloads.

Spelter—Prime Western, 4.15 @ 4.17½c., New York delivery.

Antimony—Cookson's, 10½ @ 10¾c.; United States, 9⅛ @ 9.35c., according to quantity.

The Railway Master Mechanic.

A successful master mechanic must be two-sided. He must not only keep the machinery under his charge in proper order, but he must discipline, direct and control the animated human machine that operates the inanimate tools or engines. He should therefore be a good mechanic as well as a good leader of men. He should be familiar with tools, and should understand theoretically and practically the locomotive and other steam engines, as well as the laws of combustion. He cannot ignore gas and petroleum motors. He should cultivate the habit of critically analyzing operating results shown in statements issued from his own and the accounting office. He should be a student of current technical literature. He should attend the meetings of technical societies, and under no circumstances should he fail to study their proceedings. He should cultivate a spirit of relentless self-criticism; should never be quite satisfied with what he has accomplished, and should determine to excel all others engaged in his particular line of work. To be a good leader of men, he should cultivate perfect patience, forbearance and self-control, remembering that no man ever controlled others who did not start by controlling himself. He should be even-tempered, or, if not born so, should not let anyone discover it. He should be strictly just, granting cheerfully everything due his employees, while jealously guarding his employer's interests, curbing his generosity in spending funds intrusted to him. A man so qualified should make a successful master mechanic, but would not long remain one in the present day of keen competition in all branches of railroad service.—J. KRUTTSCHNITT, Pacific Coast Railway Club.

Railway Punctuality.

"The Engineer," London, in a recent issue gives us a bit of insi le railway history with a point to it. Some years ago the directors of the London, Brighton & South Coast Railway, in consultation with Mr. Stroudley, locomotive superintendent of the line, "told him that certain main line trains were always ten minutes or a quarter of an hour late; that it was evident his locomotives could not keep time, and that they proposed to alter the time tables and allow the extra fifteen minutes or so. Mr. Stroudley replied that his engines were not to blame, that the trains were not heavy, and that if the directors would accelerate the trains ten minutes, instead of retarding them, they would secure punctuality. The experiment was tried and succeeded. The whole cause of unpunctuality was lack of smartness at the stations. No particular effort was made to expedite trains which had apparently plenty of time at their disposal. When the ten minutes were cut off it was manifest that the day of 'Dawdle' was over." This might have an application elsewhere.

The Paris Exposition—XIII.

The vertical spindle miller shown at Fig. 92 and which is exhibited at Paris by the Brown & Sharpe Manufacturing Company looks at first glance very much like the machine they have been building for some years, but it is in fact quite different, one of its new features being best shown at Fig. 93, where it is seen that a "Renold" chain is used for transmitting the motion from the vertical shaft, that comes up through the column, to the spindle. Running as this chain does, in a horizontal plane, guide pulleys are required to support its weight which are placed as shown and there is also a tightener; all these being readily accessible by removing small hand-plates. This method of driving the spindle has been found to be very satisfactory indeed; it is quiet, strong and smooth. The same chain is used in driving the feed motion for the circular milling attachment, the Brown & Sharpe Company using in fact a great deal of this chain, which they import from the works of Hans Renold in Manchester and use because they consider it to be in many cases the very best known method of transmitting motion from one part of a machine to another. Mr. Viall, in speaking to me about it, said the chain was accurately and beautifully made, and in short was "good enough to go on to a Brown & Sharpe tool," which was all he could say for it.

Fig. 94 is a section through the table of this machine, by which it will be seen that the lateral guiding of the saddle upon the base is not at the extreme edges of the latter, but that it is in the middle; the two opposing guiding surfaces being brought relatively close together as they of course should be to prevent what Professor Sweet has called the bureau-drawer action, or, rather, its non-action. The feed mechanism for this machine is much the same as for the plain milling machine shown at Page 972, but as this machine feeds by a screw the nut of which is rotated for the motion some slight modifications are introduced. In addition to the rapid movement of the platen by hand, there is a fine

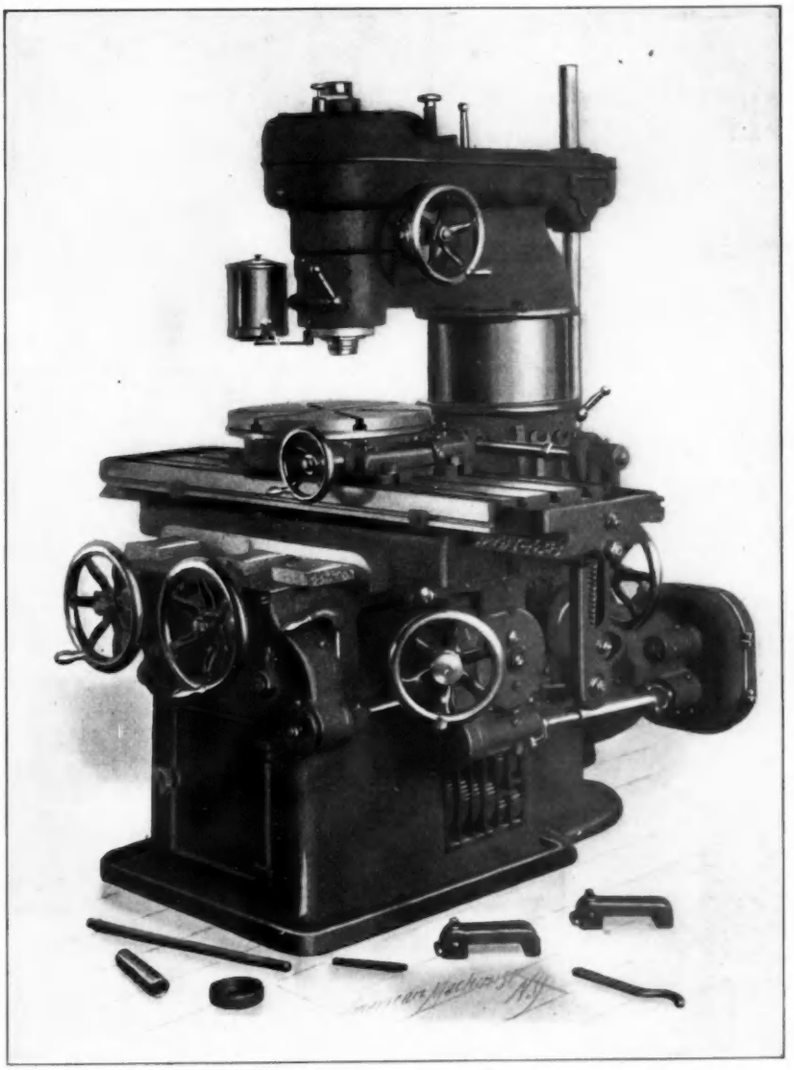


FIG. 92. VERTICAL SPINDLE MILLER SHOWN AT PARIS BY BROWN & SHARPE MFG. CO.

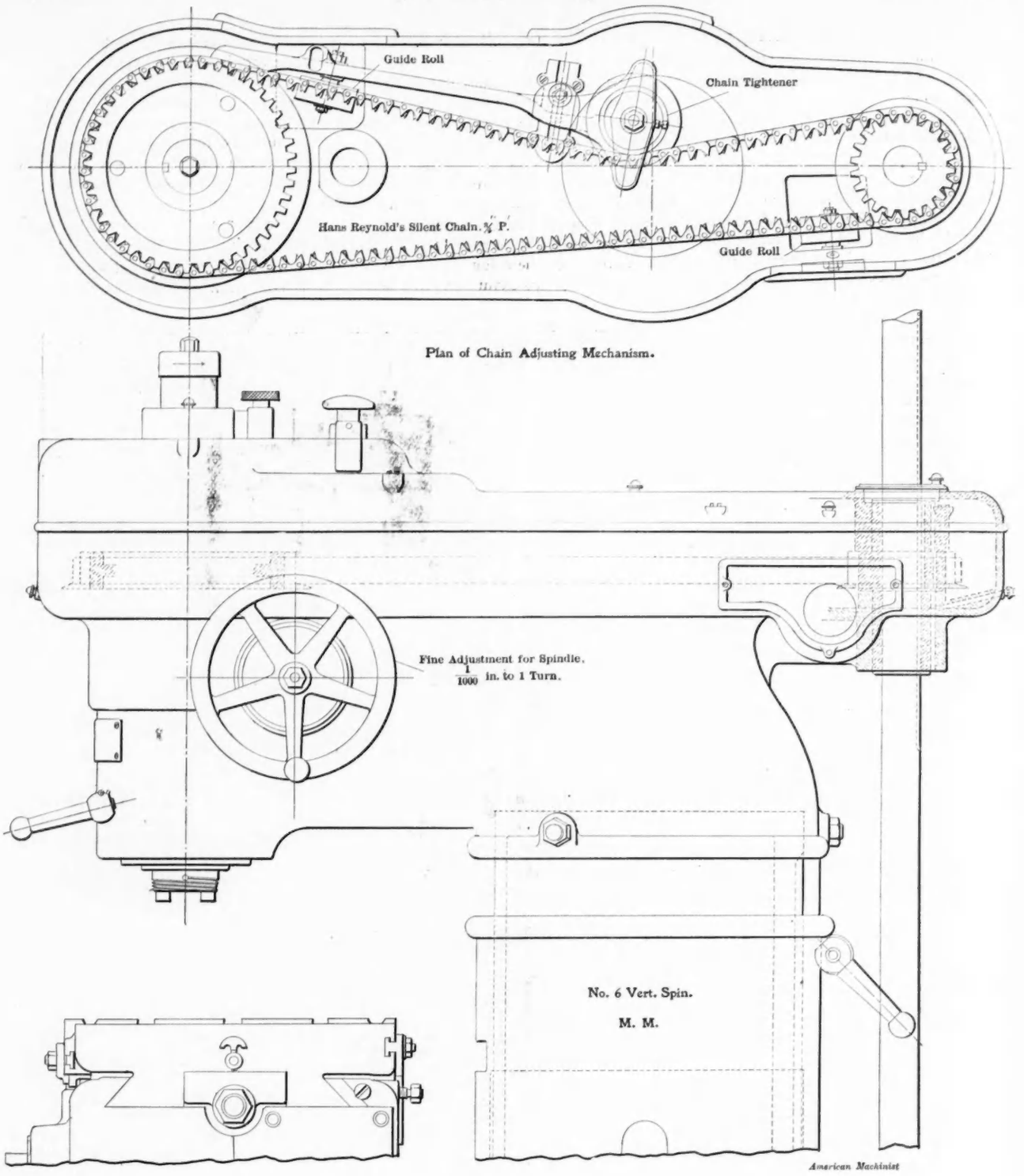


Fig. 93

SPINDLE DRIVE FOR BROWN & SHARPE MFG. COMPANY'S VERTICAL MILLER.

feed by hand as well and this is by means of the hand wheel that is set at an angle; an interesting point regarding this being that a spiral gear on the hand-wheel shaft gears into a spur gear on the worm shaft, thus saving several gears otherwise required in "getting around the corner."

Change gears give sixteen changes of feed in either direction for each speed of the spindle. These are in geometric progression from the finest to the coarsest ever required. The feed is automatically tripped by the dog *A* connecting through the mechanism shown to the shoe at *B*, which operates the clutch.

SOME CURIOUS GEARS.

The company show two gear models which are interesting. One of them is practically, if not identically, the same as they showed at Chicago, in which the principal feature was the driving of two racks in grooves placed at several different angles by the same spiral gear wheel. Two views of the new model are shown at Figs. 95 and 96. It is made up of some special forms of gears, although they are all such as are used in actual practice in machine construction. There are intermittent spur and intermittent bevel gears, "herring-bone" gears, sprocket-wheels and chains, two forms of worms and worm-wheels, and a pair of internal differential or epicyclic gears. One of these differential

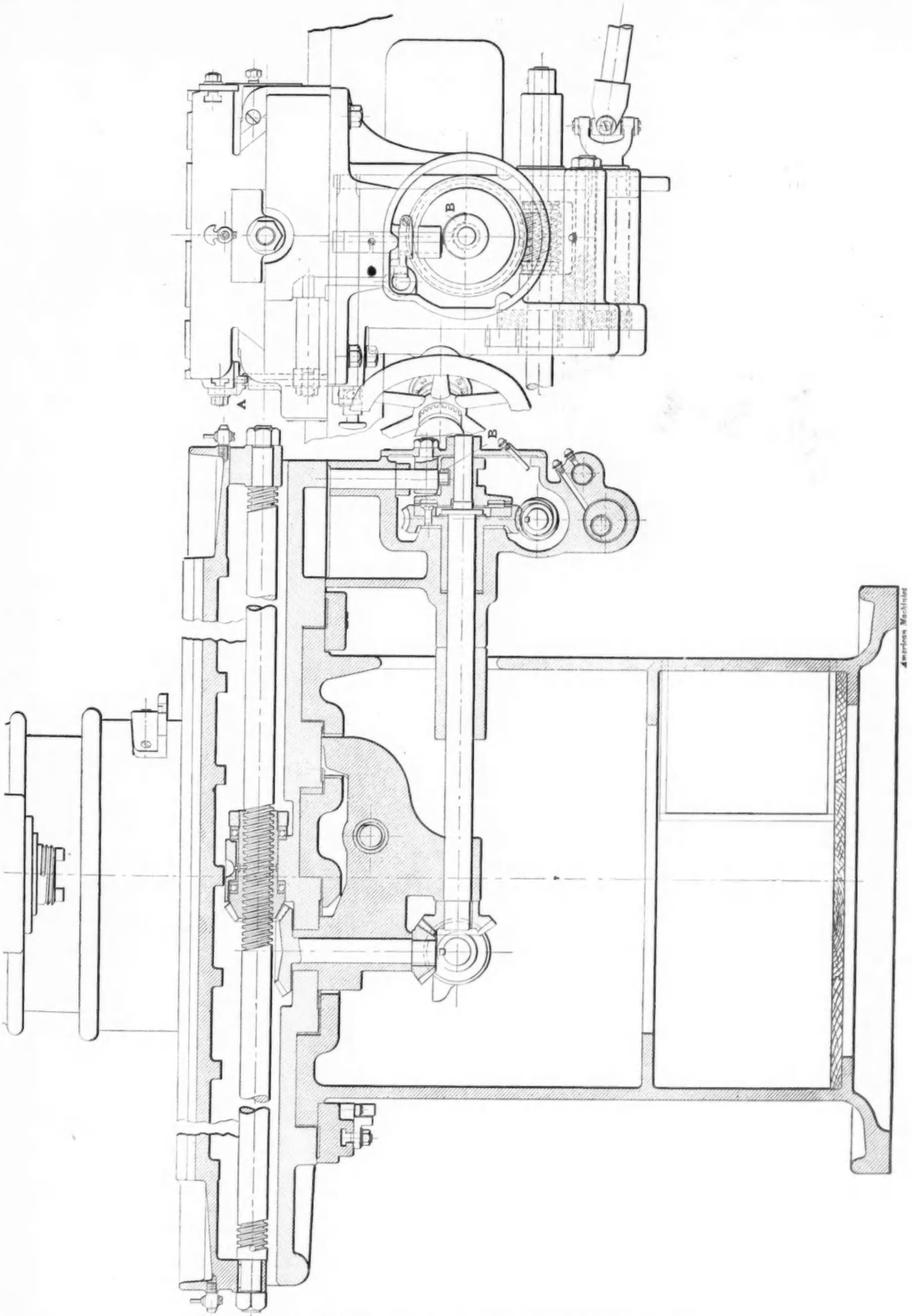


FIG. 94. SECTION THROUGH TABLE OF THE BROWN & SHARPE VERTICAL MILLER.

gears is stationary, the other is loose on an eccentric pin on the end of the shaft. The first has ninety-six teeth, the second ninety teeth, the difference being six teeth. One revolution of the shaft revolves the gear mounted upon it one-fifteenth of a turn in the opposite direction. $(90 \div 6 = 15.)$ It is interesting to note that while, to make one complete revolution of the gear on the eccentric pin in relation to the stationary ring, requires fifteen turns of the shaft, the fifteen turns or throws of the eccentric pin make sixteen throws of the gear mounted on it, as shown by the short finger on the gear and the sixteen graduations on the stationary ring.

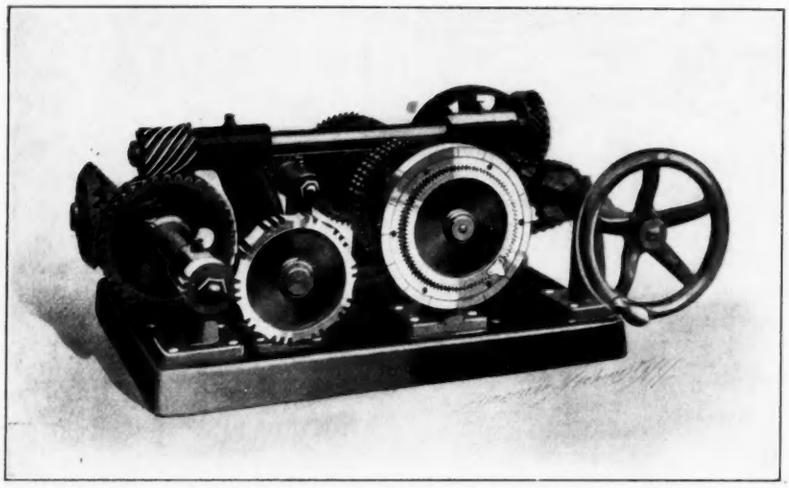


FIG. 95.

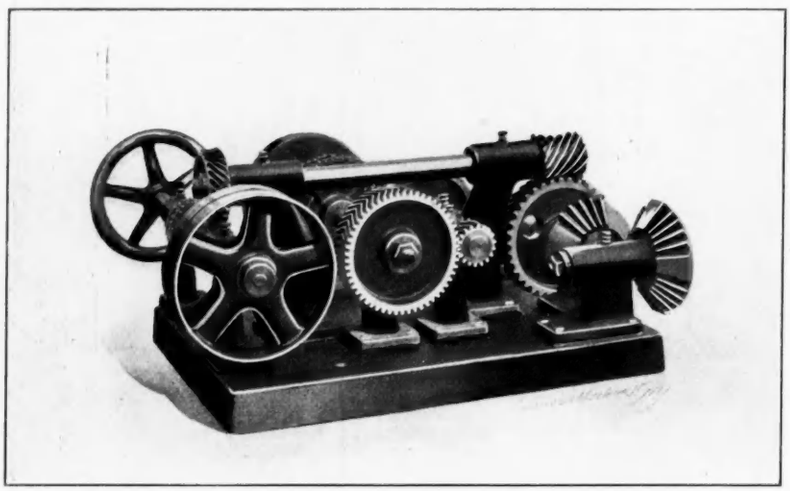


FIG. 96. GEAR MODEL SHOWN AT PARIS BY BROWN & SHARPE MFG. COMPANY.

In the first, or smaller pair of worm gears, the worm is cut as a spiral gear. The worm-wheel meshing with it is hobbed to suit. In the other pair the larger gear is cut as a worm while the smaller gear is hobbed. Thus the driving-gear is the worm-wheel; the worm in this case being much larger than the worm-wheel. In this pair of gears there are four or more teeth in contact at all times, and the lines of contact on the teeth are long, giving a specially smooth and durable drive.

Both of the above pairs of gears are similar to those used regularly on the automatic gear cutting machines.

In our issues of June 22-29, Oscar J. Beale gave a full and very interesting illustrated account of such gears and showed just how they are made.

The sprocket-wheels are cut with Brown & Sharpe cutters, according to the Brown & Sharpe system, and are such as are suitable for bicycles, motor carriages, etc.

The driving gear of the pair of intermittent spur gears has two groups of teeth, one of two and the other of three teeth, making the intermittent motion variable.

In this class of gears it is necessary that the driven gear should be under tension as would be the case under working conditions. In this model a friction washer is used for the purpose.

The newly designed plain grinding machines which form so important a feature of the exhibit and which are shown at work to those interested were fully illustrated and described in our No. 27 and a new automatic gear cutting machine that is in the exhibit and which embodies some specially interesting features remains to be taken up at another time.

ANOTHER FRENCH BEVEL-GEAR PLANING MACHINE.

Another interesting bevel-gear planer of French design is shown at Fig. 97. In its general design this machine is very similar to many others that are to be seen in British and Continental workshops, but it has what I believe is a new feature in its provision for cutting helical instead of straight teeth, where the former are desired, as they seem to be so often by French and other Continental machine builders. This machine forms the tooth by copying an enlarged template. It is built by Usines (Works) Bouhey, an incorporated company having workshops in Paris at 43 Ave. Daumesnil, and the photograph was taken in the Exposition and therefore shows portions of other machines by the same builder. The bevel-gear planer resembles somewhat the Richards side planer, *i. e.*, it has on its bed a saddle which is fitted to suitable guiding surfaces and reciprocated by the slotted crank and connecting rod seen at the right of the machine. This saddle has an extending arm on which is a smaller saddle resembling those used on planers and carrying the tool in much the same manner. The blank to be planed with teeth is mounted upon an arbor which can be placed at the proper angle by adjusting a sector-plate which is fitted to the front side of the base of the machine and is pivoted near the top as seen, where a spindle is seen projecting from this pivot and is terminated by a cone which has been flatted on the upper side to facilitate setting the blank so that the apex of the pitch cone will coincide with this center. This is done by adjusting the projecting arm which is fitted to the face of the sector-plate and can be moved in a line parallel with the work-arbor until the blank is at the right hight. The feed takes place by the rotation of the sector-plate (clockwise), worm-teeth being cut in its periphery for that purpose which are engaged by a worm on the shaft at the right near the bottom of the machine. The indexing is by means of the worm and wheel below the blank and the template is seen attached to the upper end of the curved bar which passes through a bearing at the lower extremity of the work-holding arbor. This bar is rotated in a vertical plane with the sector-plate by the feed motion and as its upper extremity rises, it carries the template with it, and the template, resting against a guide pin or point, and being held against it by a weight causes the blank to be rotated as the feed takes place so as to reproduce the form of the template in the tooth being cut.

So far as described the machine would produce only straight teeth of the ordinary kind, but by additional mechanism, which, unfortunately, is not clearly shown in the

photograph, it will cut helical teeth like those seen on the blank which is in the machine and which has been partially cut. To produce this effect it is of course clear that the blank, the curved bar, the template, the point against which the template rests and all their belongings must be given an independent rotary motion as the tool passes along the side of a tooth and during the back stroke of the tool must be returned to be again rotated the same amount during the succeeding cutting stroke. This motion is secured by attaching the proper connections and links to the tool saddle and to a block which slides upon the curved bar seen at the left hand extremity of the machine just behind the tooth template. Thus arranged all the parts named above are rotated during the cutting stroke at a sufficient rate to give the desired helix and of course during the return stroke of the tool are brought back again. It is evident that when the curved bar is swung upon the axis which coincides with the axis of the gear being cut any given point in the template will move in the arc of a circle. It moves in such an arc when its motion is controlled by the template itself and of course must do so when moved by its connection to the sliding block, which is in turn moved upon the curved bar by its connection to the tool saddle. But if this sliding block which carries the guiding point for the template moved in a straight line its position on the template would be altered because the template moves in the arc of a circle. It is for this reason that the bar is curved instead of straight, and in fact it corresponds to the geometrical pitch circle *a b* of the bevel-gear drawing Fig. 98, although of course its radius is enlarged in proportion to its distance from the apex of the pitch cone and for the same reason that the template is also larger than the teeth to be planed. It has been shown by American practice that if you have practically perfect bevel-gears that are set to engage precisely as they should and can be kept in such engagement, the result is all that anyone could possibly ask. But these conditions are not always secured here and probably are not secured anywhere else; and if small errors of form and of position

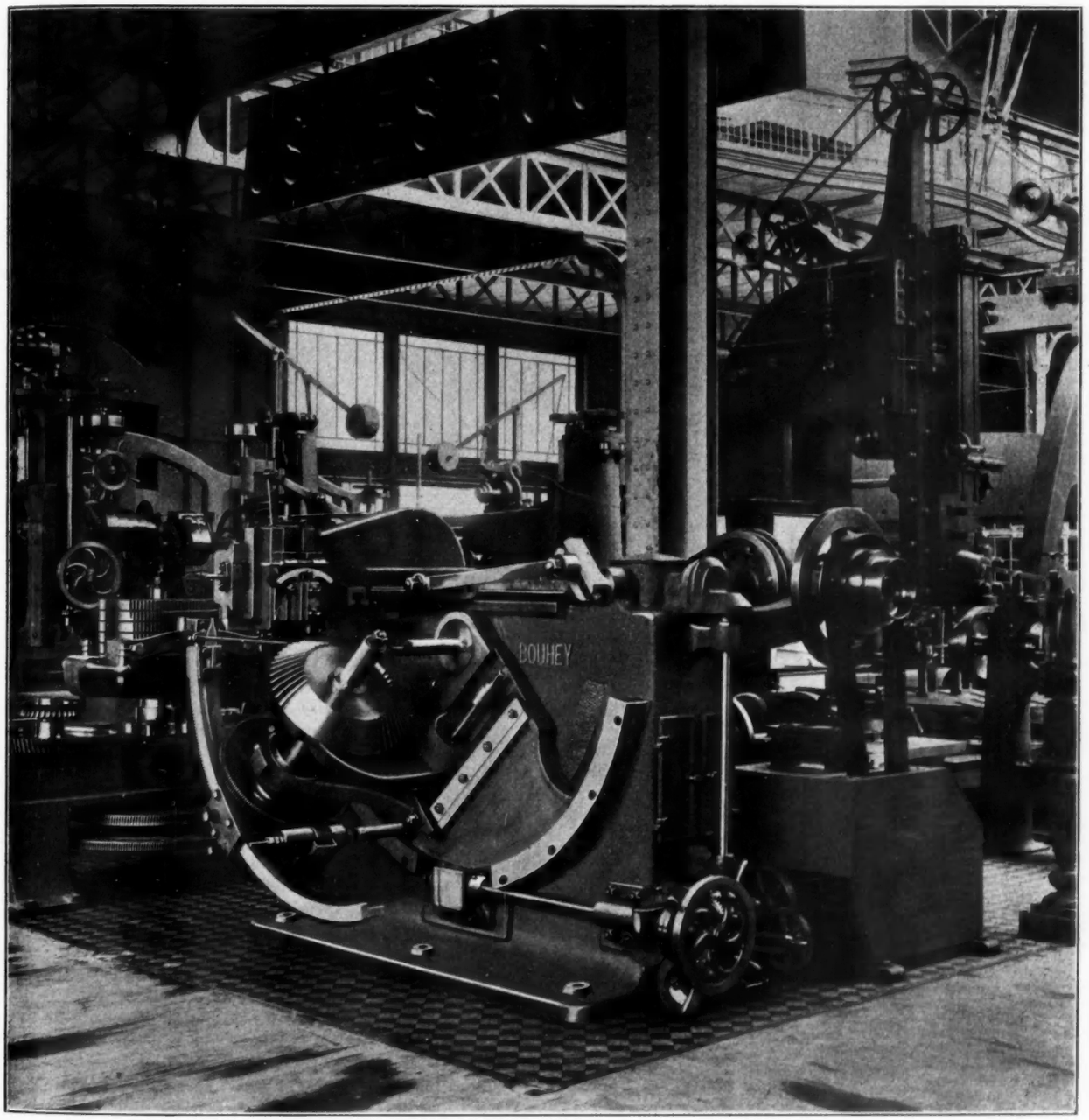


FIG. 97. BEVEL GEAR PLANING MACHINE SHOWN AT PARIS BY USINES BOUHEY, OF PARIS.

are bound to be present, then perhaps it is a good idea to have the helical instead of straight teeth, and, if so, then this machine seems to afford a very good means of getting them. At any rate it is interesting and ingenious.

A FRENCH VERTICAL MILLER.

At Fig. 99 is the reproduction of a drawing of a vertical miller which is also made by Usines Bouhey, and this machine has a form of table which is interesting because it is a compound of the usual rectangular platen with the circular rotary platen for milling circular work, and both are always in place and ready for use, each without interfering with the other. This is accomplished by the plan of letting the circular platen down into the rectangular one in the manner shown, so that the tops of both are at the same level, and there is a free space all around the edge of the circular platen for clearance and to prevent bother from chips. Both the platens have T-slots, and if the work is to be milled on the arc of a circle, it is attached to the circular platen only; but if it is to be milled in straight lines parallel or at right angles to each other, it is fastened to both of them and the circular feed mechanism thrown out of gear. Thus the excessive hight of the surface of the circular table is avoided, and of course the trouble of changing from one kind of work to the other by removing or putting on the circular platen is avoided.

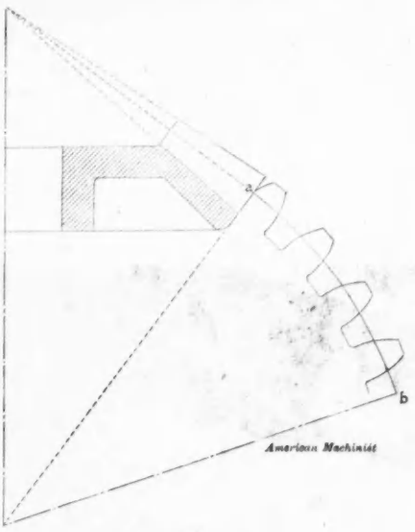
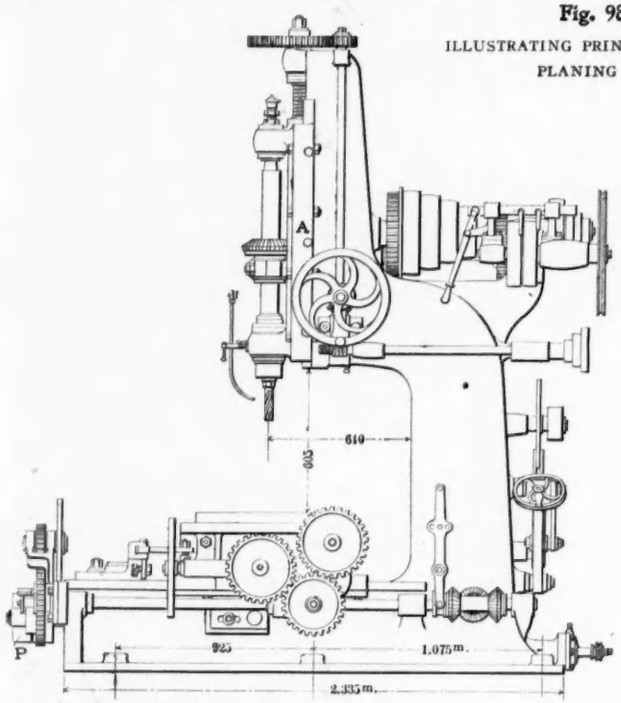
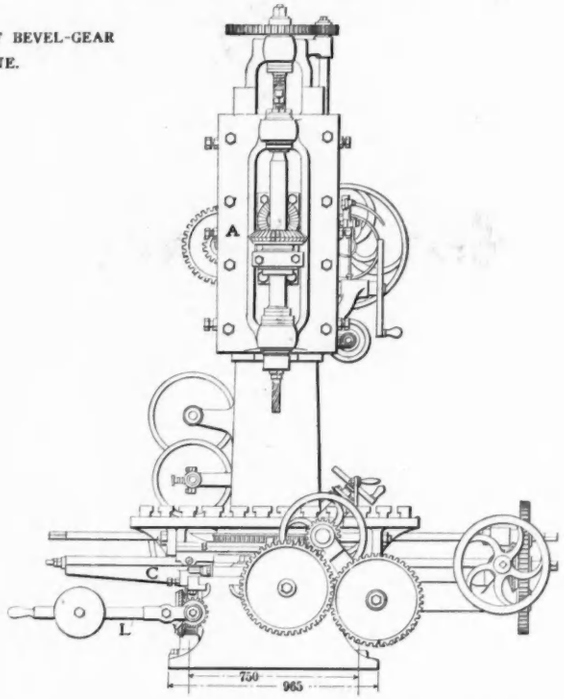


Fig. 98

ILLUSTRATING PRINCIPLE OF BEVEL-GEAR PLANING MACHINE.

What the builder alludes to as a recent improvement in this machine is the fact that the feed of the table, instead of being derived from cone pulleys, is by means of the disques à friction, which he says permit all rates of feed from the minimum to the maximum. They will be recognized as the Sellers friction disks, and from them the feed mechanism can be readily traced throughout its course.





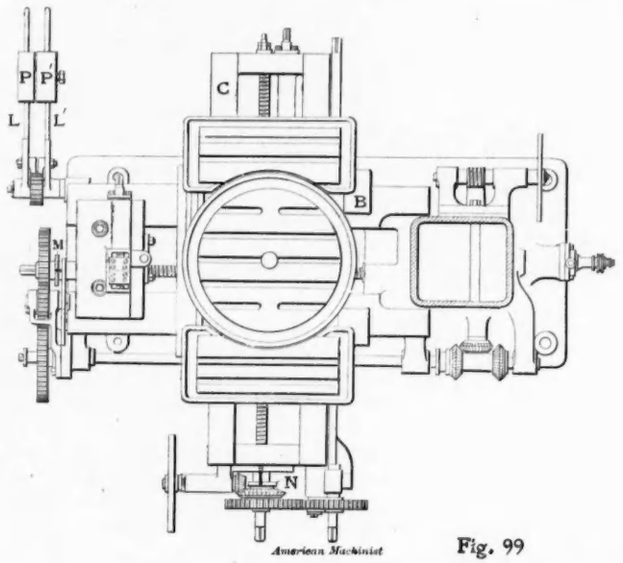


Fig. 99

VERTICAL MILLER SHOWN AT PARIS BY USINES BOUHEY, OF PARIS.

On the bed of the machine in front of the saddle is an adjustable angle plate which is adapted to hold a guide roll in such position that a template fastened to the saddle, as shown in the side view, Fig. 99, will bear against it, and thus reproduce any outline which may be given to the template. When thus milling forms of irregular outline the saddle is released so that it can move independently of the screw (by means of an open and shut nut), and the saddle is then moved upon the bed by means of the two levers *L L'*, which carry weights that can be adjusted to give any required turning moment, and which act by means of pawls upon the ratchet-wheel which is common to both; this arrangement allowing the levers to be set at some angular distance apart to secure a more even turning effect and pres-

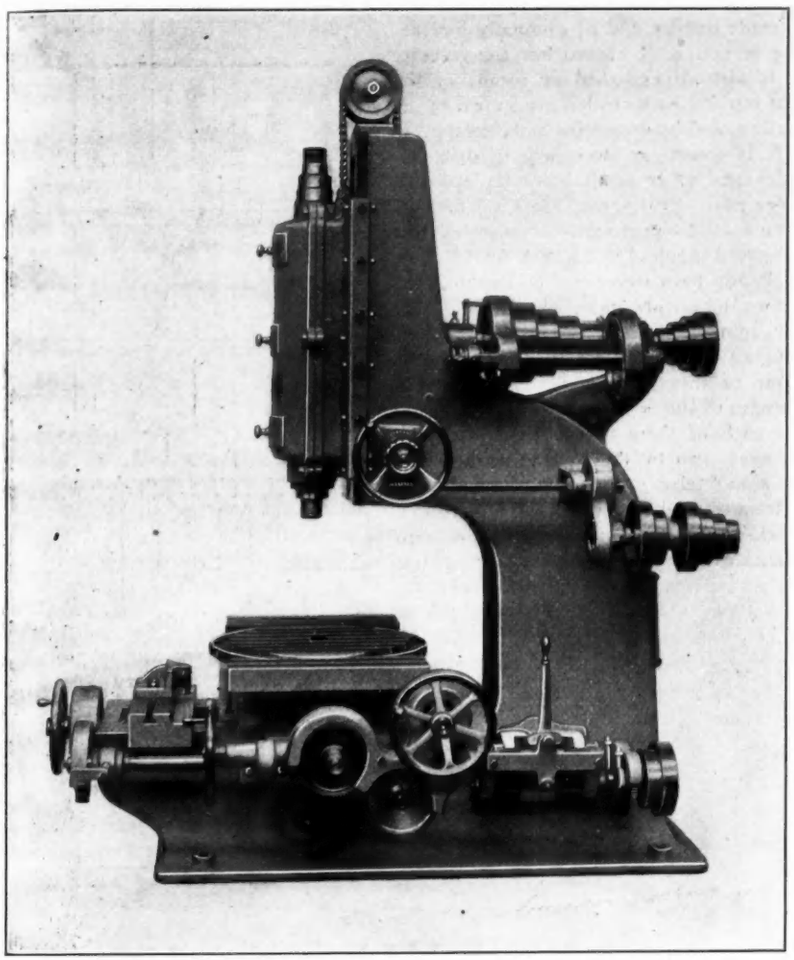


FIG. 100. VERTICAL MILLER SHOWN AT PARIS BY FREDERICK SCHULTZ.

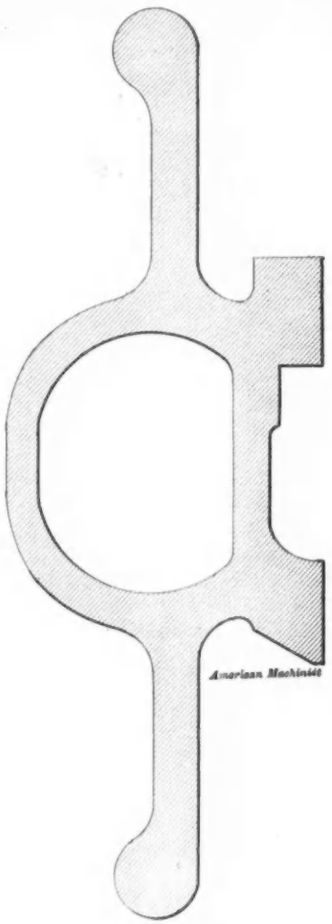


Fig. 103

SECTION OF ARM OF BICKFORD DRILLER.

sure upon the guide roll or to enable the operator to use one or both levers together, according to the direction of inclination of the template. Although the Bouhey establishment kindly supplied the drawing of the machine, I have no photograph of it as built by them, but instead show a photograph of what is essentially the same machine as built by Frederick Schultz, who gives to Bouhey the credit of originating the type, but who himself builds an excellent example of it, which is also exhibited.

AN IMPROVED RADIAL DRILLER.

At Fig. 101 is a photograph of a radial driller shown by the Bickford Drill & Tool Company, of Cincinnati, and which, although it looks very similar to other machines of its class, yet possesses a number of new features worthy of attention. Reference to Fig. 102 will show that the column is double, or, in other words, that the usual "stump" is not really a stump at all, but is extended up to form the real column which is the main dependence for rigidity, and that the sleeve to which the arm clamps has a bearing upon the column at top and bottom, rests upon conical rollers for ease of movement, and may be clamped in position by closing the ring *A*, which is made in two parts and clamped by a binding bolt in front, as shown in the photograph. Fig. 102 also shows the driv-

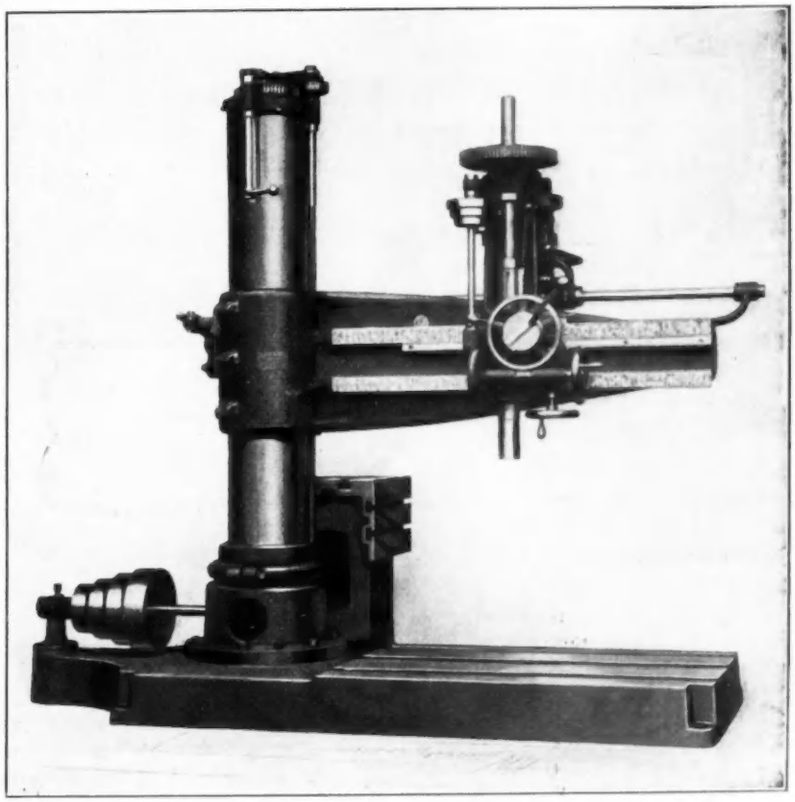


FIG. 101. RADIAL DRILLER SHOWN AT PARIS BY BICKFORD DRILL & TOOL COMPANY.

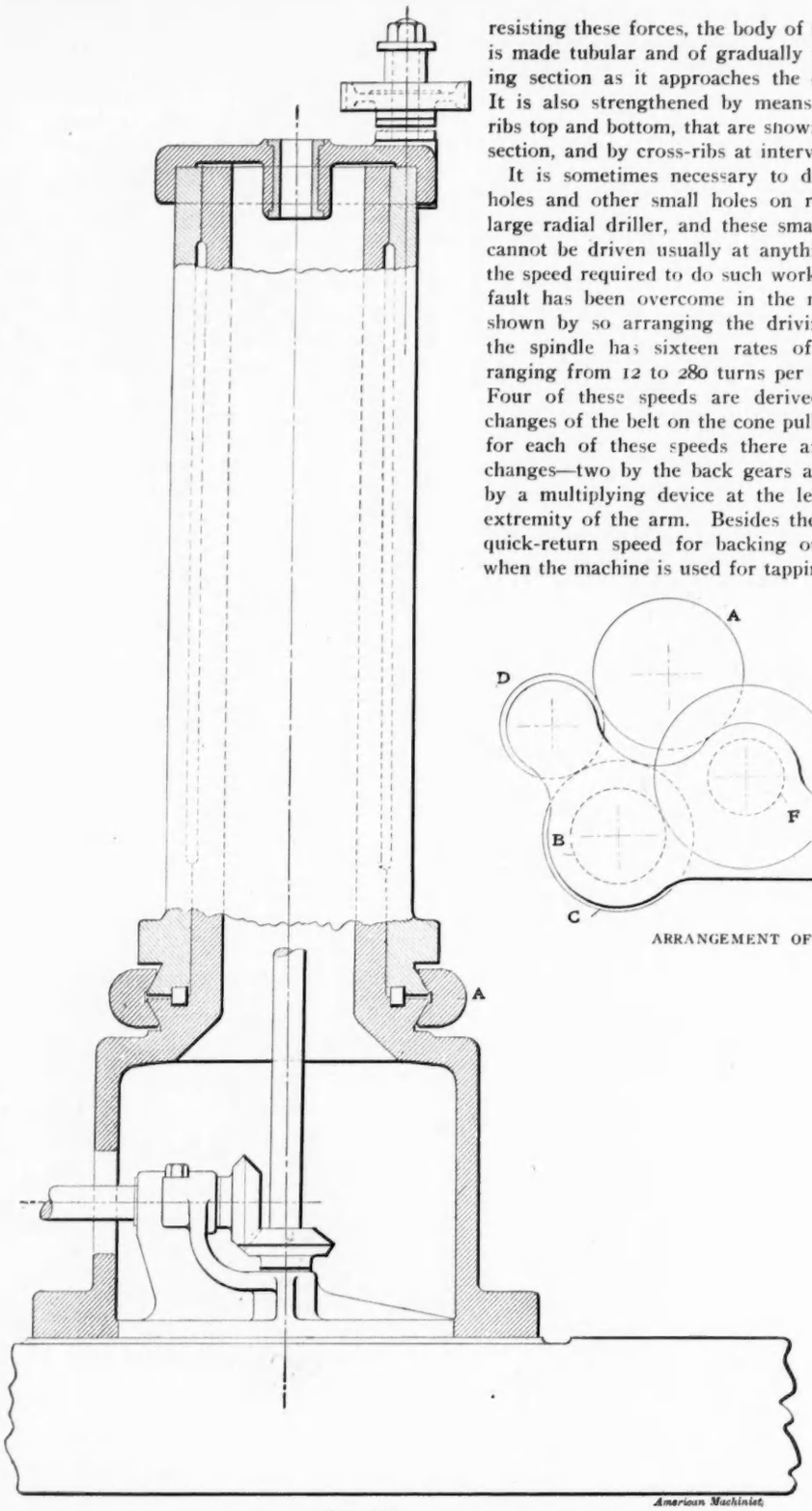


Fig. 102

SECTION THROUGH POST AND COLUMN OF THE BICKFORD RADIAL DRILLER.

ing arrangement through the column and the ball bearing for the thrust of the arm-elevating screw. A cross-section of the arm is seen at Fig. 103. Owing to the fact that the drill spindle in a radial driller must be at the side of the arm, there is of course a tendency to twist the arm as well as to bend it upwards. With a view to resisting these forces, the body of the arm is made tubular and of gradually increasing section as it approaches the column. It is also strengthened by means of the ribs top and bottom, that are shown in the section, and by cross-ribs at intervals.

It is sometimes necessary to drill oil-holes and other small holes on rather a large radial driller, and these small drills cannot be driven usually at anything like the speed required to do such work. This fault has been overcome in the machine shown by so arranging the driving that the spindle has sixteen rates of speed, ranging from 12 to 280 turns per minute. Four of these speeds are derived from changes of the belt on the cone pulley, and for each of these speeds there are four changes—two by the back gears and two by a multiplying device at the left-hand extremity of the arm. Besides there is a quick-return speed for backing out taps when the machine is used for tapping. At Fig. 104 is shown the arrangement for changing the speed and also that for backing at a higher speed.

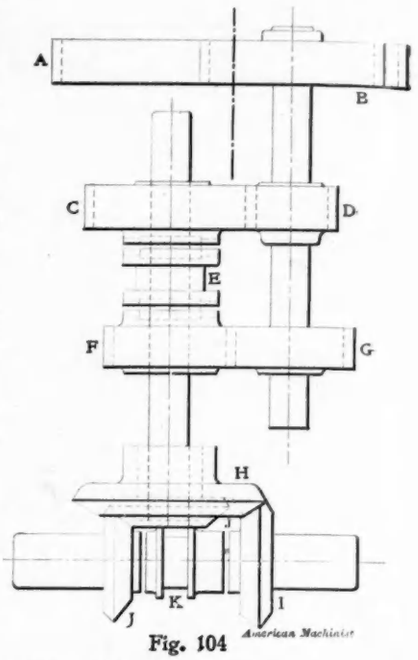


Fig. 104

SPEED-VARYING GEARS AND REVERSING ARRANGEMENT, BICKFORD DRILLER.

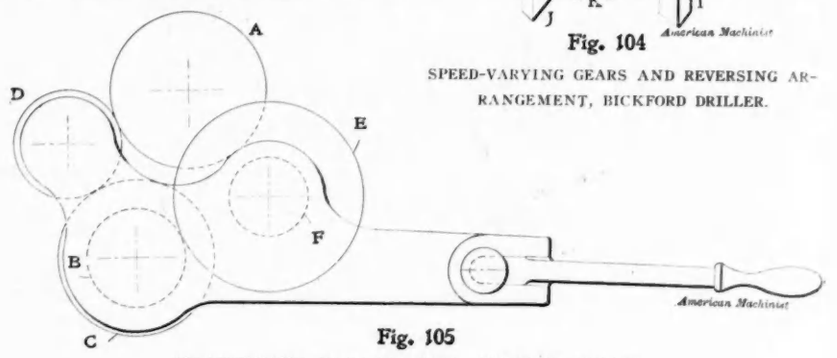


Fig. 105

ARRANGEMENT OF BACK GEARS, BICKFORD DRILLER.

In this view *A* is the spindle gear, *B* the spindle gear pinion and *E* a clutch operated by a lever extending out toward the front of the head, at the right in the photograph. Gears *F* and *G* are even, while gears *C* and *D* are in the ratio of 1 to 2. As the motion used for drilling comes through the bevel gears *I* and *H*, the ratio of which is 2 to 3, it is obvious that the speed of the pinion *B* will be the same as, or double, that of gear *H*, according to whether clutch *E* is engaged with gear *F* or gear *C*. To reverse the spindle clutch *K* is engaged with miter *J*, which backs the tap out at 1½ times the speed it was run in.

The back gears are located on the arm (at the extreme left in Fig. 101), transmitting the motion direct to the horizontal shaft that passes along above the arm, and are so designed that they may be engaged or disengaged while the machine is running.

This is accomplished by mounting the gears on a quadrant, as shown in Fig. 105, in which *A* is a gear keyed to the horizontal driving shaft, *B* and *C* two gears driven through miters from the vertical driving shaft, *D* an intermediate engaged with gear *C*, *E* another intermediate engaged with gear *B*, and *F* a pinion for meshing with gear *A*. Throwing the handle down as shown gives an even drive through gears *C*, *D* and *A*, and throwing the handle up gives a 4 to 1 drive through gears *B*, *E*, *F* and *A*. The quadrant is held in position by a retaining pin which is released by the grasp of the operator, thus

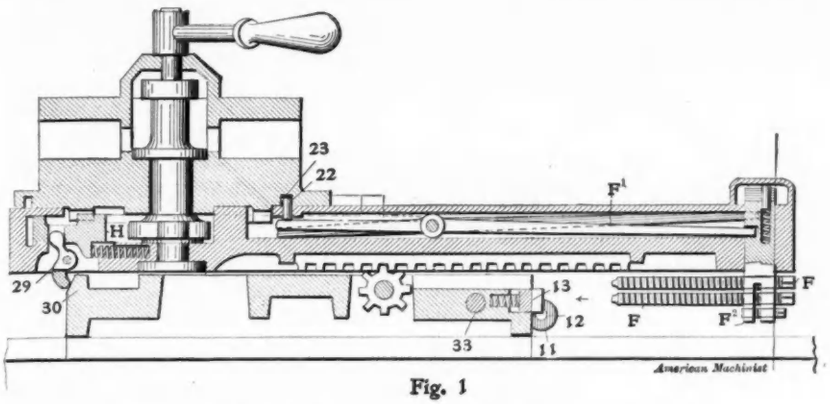


Fig. 1

VERTICAL LONGITUDINAL SECTION OF TURRET, SLIDE AND CARRIAGE.

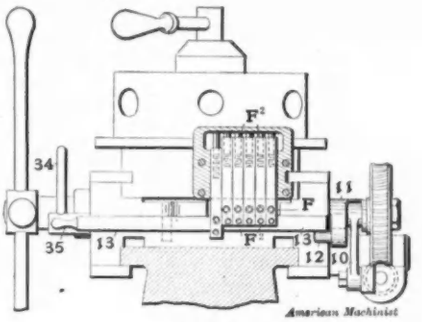


Fig. 2

TURRET, SLIDE AND CARRIAGE FROM THE BACK, WITH SECTION OF SLIDE.

making but one movement of his hand necessary to use it. Thus he has at command a wide range of speeds, many of which he obtains without shifting the cone belt. For each speed of the spindle there are three rates of feed. F. J. M.

Adjustable Automatic Feed Release for Turret Lathes.

The cuts show a novel and interesting adjustable automatic stop or feed-releasing device for turret lathes. The turret head as shown here is made to carry six tools, which it was not necessary to reproduce in position. The turret is mounted in the usual way upon a carriage which is moved forward or backward by rack and pinion, the pinion shaft having a worm gear on the rear end for the power feed, and a hand wheel for the operator in front. The arrangement here illustrated is for releasing the power feed when the drill or other cutting tool has traveled its required distance, an entirely independent adjustment being provided for each tool.

The turret is rotated and locked by devices sufficiently familiar to our readers, the locking bolt *H* being in this case within the circular projecting flange of the turret and working outwards in the act of locking. The unlocking is accomplished by the lower end of lever 29, Fig. 1, coming in contact with rib 30 on the carriage. When the slide moves forward the spring throws the bolt into locking position again.

The most interesting feature of this machine is in the automatic stops for the feed of the several tools. As six tools are provided for in the turret as shown, six similar mechanisms are provided, each of which operates only when its own tool is in use. The feed of the turret-carrying slide is without novelty. The operation of throwing out the feed is accomplished by pushing lever 13 laterally a sufficient distance to clear pin 12, when the worm drops of its own weight out of engagement.

There are in the turret carrier six long horizontal levers *F'*, all fulcrumed on the cross-shaft 24. The shorter ends of these levers extend under the turret, and each has a short pin 22 projecting upward. These ends of the levers are all of different lengths, so that the pins all stand at different radial distances under the turret. All the pins normally bear upward against the flat under surface of the turret, being held there by the weight of the long ends of the levers. The under side of the turret is provided with six cavities 23, each at the proper radial distance to allow a pin of one of the levers to enter it freely when the tool corresponding with that lever is in its cutting position. No other pin can enter this cavity, and no other lever therefore can be permitted to move by it but that to which it belongs. These cavities, whose positions are shown in Fig. 3, are not only at different radial distances, but are also spaced at such angular distances as correspond with the different lateral positions of the levers. These cavities are deepest in the middle, and curve each way circumferentially, so that when the pin is at the deepest (in the middle of the cavity, which will be its position when

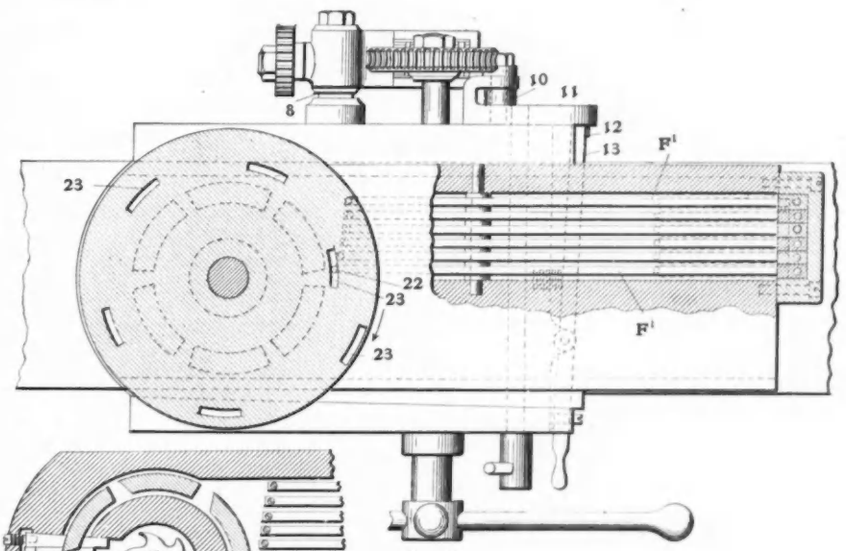


Fig. 3

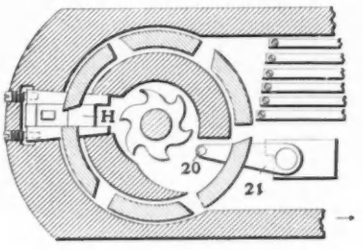


Fig. 4

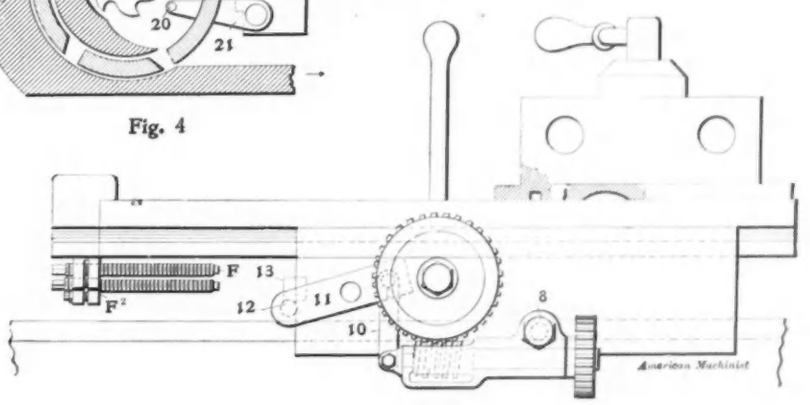


Fig. 5

PLAN, PARTLY IN SECTION, AND REAR ELEVATION OF CARRIAGE AND TURRET, WITH PLAN OF ROTATING MECHANISM.

the turret is locked), the further onward rotation of the turret will carry the pin downward again to its normal position and correspondingly raise the other end of the lever. The long end of each lever moves a vertically sliding piece F^2, Figs. 1 and 2, the lower end of which carries a long horizontal screw F, by which the adjustment of the feed release is secured. There are six of these vertical slides F^2,

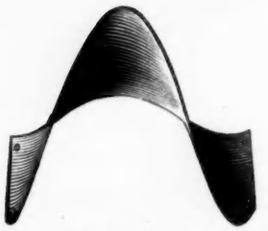


FIG. 1. ONE TURN OF A CONVEYOR.

conveyors, which has obtained for many years, consists of first stamping a disk with a central hole of proper diameter, this disk being afterwards formed into a spiral shape, as shown by Fig. 1; these flights, as they are called, being riveted together, placed upon pipe and properly supported, thus forming a complete spiral conveyor.

In this process of manufacture about

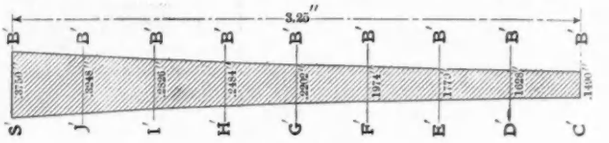


Fig. 3

CROSS-SECTION OBTAINED BY THE CONSTRUCTION SHOWN IN FIGURE 2.

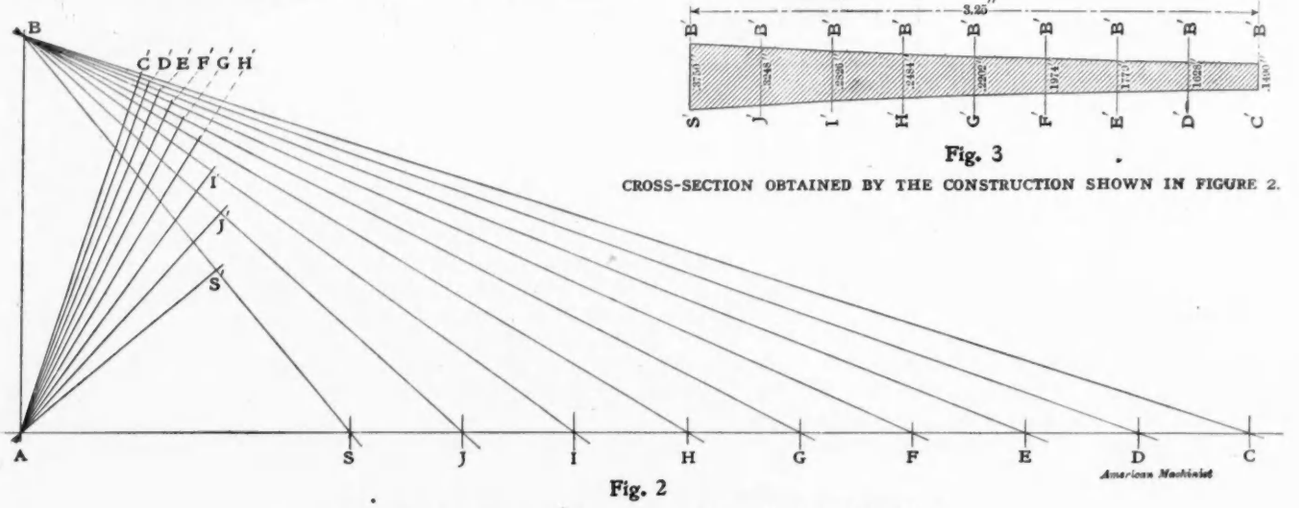


Fig. 2

CONSTRUCTION FOR FINDING THE CROSS-SECTION OF A CONVEYOR.

one for each lever. When the slide F^2 is moved downward, by the pin on the short end of the lever entering its cavity in the turret, then the screw F is brought low enough for the end of it to strike the cross-lever 13 and by its advancing movement to move this lever and release the worm, as previously explained, and stop the feed. By the adjustment of the length of screw F the stoppage of the feed may be made as accurate as may be desired. The lower end of F^2 is split, both portions being threaded, and when the adjustment of the screw is satisfactory, a tightening of the lower screw binds the long screw securely. The feed may be thrown in by hand by handle 34 on shaft 33, lever 13 being spring-actuated to lock the worm-carrier in position, and lever 13 may be moved by its handle 35 for throwing out the feed whenever desired. The inventors of this arrangement are George C. Bardons and George W. Drake, Cleveland, Ohio.

Rolling Screw Conveyors.

The manufacture of specialties has often been the means of developing novel processes in the manipulation of metal, and the results attained, although out of the ordinary line of general manufacture, frequently suggest possibilities in other lines of manufacture before considered impracticable.

It is likely that a very large proportion of well-informed mechanics have very little acquaintance with what is termed the screw or spiral conveyor. This device consists of spiral flanges or flights mounted upon a central shaft, the conveyor, as it is called, being placed in a trough or box of proper dimensions, and, when revolved, the action is to propel grain or other material in a horizontal direction. It has extensive application in the handling of grain, cotton seed and like granular material, also such articles as cement and ground material of all kinds.

The method of manufacturing spiral one-third of the metal was lost in stamping out the disks and the rivet holes and laps presented obstructions to the passage of the material, which were objectionable. In addition to this defect of construction, the rivet heads wore off before the flange or flight itself was worn out, and the flights would come apart and the conveyor go to pieces. To overcome these objections it was desirable to produce the

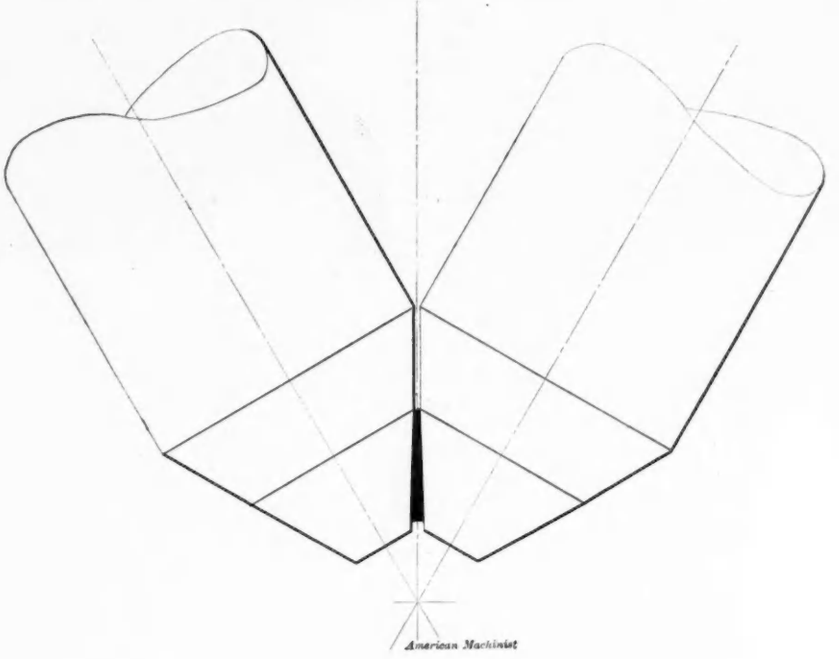


Fig. 4

FORM OF THE ROLLS.

spirals or flanges from a continuous strip of metal, thus doing away with the rivets and rivet holes, and at the same time saving the loss due to cutting the plate metal into the form of disks.

This problem received attention from screw-conveyor manufacturers and inventors, but the experiments were unsuccessful until about two years ago, when Mr. F. C. Caldwell, connected with H. W. Caldwell & Son Company, of Chicago, Ill., after several years of work on the problem, succeeded in practically producing the flights or flanges from a single strip of metal.

In arriving at this result some interesting mathematical and mechanical problems were encountered. It is of course a familiar fact that the developed length of a spiral (or more properly helix) corresponds to the hypothenuse of a right-angle triangle, the base of which is the pitch of the helix, the altitude being the circumference of the core around which the helix is wrapped.

The proper name of the form to be made, which we have termed the "flight" or "flange" of the screw conveyor, is "helicoid," the definition of which in Webster being: "A warped surface which may be generated by a straight line, moving in such a manner that every point of it shall have a uniform motion in the direction of a fixed straight line, and at the same time a uniform angular motion about it."

The triangles which would represent the helices of the helicoid at different diameters would have bases of uniform length, as of course the pitch of the helicoid is uniform throughout the width of the flight. But since the circumference at different points along the face of the flight varies with the diameter, the altitudes of the triangles representing the various helices would vary, each being equal to the circumference of the imaginary cylinder around which the helix might be supposed to be wrapped.

The problem presented itself something like this: The quantity of material in the rectangular strip from which the flange was to be rolled must be ascertained before and after it is manipulated. Assuming that conical rolls are the proper means of producing the spiral, then it is clear that, as regards the inner circumference, the action is simply one of bending without change in the length of this edge, and hence at this edge there should be no reduction from the thickness of the original strip. At the outer edge the length must, however, be largely increased, and this must be accomplished by reducing the thickness at that edge. As the quantity of metal is the same after as before rolling, it follows that the reduction in thickness must be such that the final thickness at this point multiplied by the length of the outer helix shall equal the original thickness multiplied by the original length of the straight strip. The same relation necessarily holds for all diameters, the rule being that the final thickness at any diameter shall be such that when multiplied by the length of the helix at that diameter, the product shall equal the product of the original thickness by the original length.

Looking at the matter from a slightly different standpoint, and assuming again that it is necessary to arrive at the result by the use of cone-shaped rolls, the first essential in manipulating the rectangular strip would be to have the pass between the rolls of such a shape that the metal having been drawn or rolled through the pass would have such a cross-section that the quantity of metal at the outer edge of the spiral, the inner edge of the spiral and all points between would be the same. Unless this were done, it would of course be practically impossible to operate the roll.

In the case of a flat disk the length of any circumference is strictly proportional to the diameter. If a pair of truly conical rolls with straight sides be made, a strip of metal rolled through them will have its resulting thickness at various points of its width strictly proportional to the distance of the points from the apex

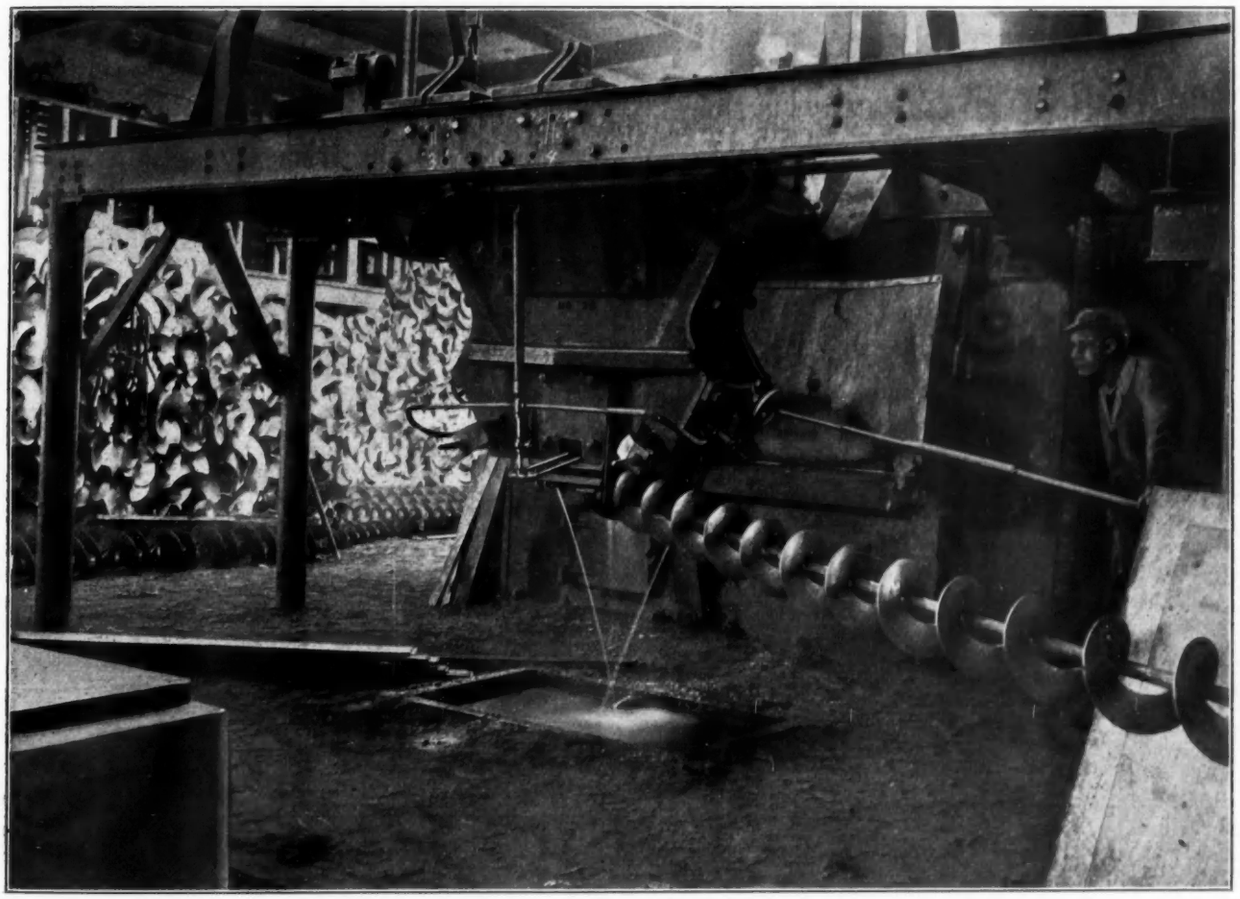


FIG. 5. COMPLETE ROLLING MILL FOR MAKING CONVEYORS.

of the conical rollers, and the resulting shape of the strip will be a flat disk. This we would expect, and, in fact, in the course of preliminary experiments, Mr. Caldwell found it to be the case, it being found to be quite impossible to produce a helicoidal shape by such rolls. In the case of the helicoid the length of the helices at different diameters, unlike the flat disk, is not in simple proportion with the diameters, and to produce the helicoid it is only necessary to curve the sides of the cones so as to reduce the thickness at different points in the width of the strip in proportion to the length of the helix at those points.

The mathematical problem presented is first to arrive at the theoretical cross-section of the proposed helicoid. This may be done by ordinary arithmetic, by the use of the familiar formula for determining the hypothenuse of right-angle triangles—the known quantities being of course the pitch of the screw and the diameter or circumference of the various cylinders on which the helices may be supposed to be wrapped. Having found the length of the helix at a given diameter, the thickness of metal at this point (or what is the same thing, the space between the rolls at the given point) would equal the product of the length by the width of the original rectangular strip divided by the length of the strip at the given diameter after rolling.

For example, if the strip were 1 inch thick and 12 inches long before rolling, and when rolled should be 24 inches in length at the outer edge of the flight, then this outer edge would be one-half as thick as the original strip, or ½ inch thick, and the pass between the rolls at this point should be ½ inch. This method, however, proved very tedious in practice and it was found better to adopt geometrical construction for determining the cross section that is to be produced by the rolls.

Fig. 2 indicates the construction as used for one of the flights, and Fig. 3 indicates approximately the cross section obtained.

Referring to Fig. 2, the construction used is as follows:—Let $A\,C$ equal the circumference of the conveyor flight at its outer edge, $A\,S$ its circumference at its inner edge and $A\,B$ the pitch of the helix. $C\,B$ will then equal the length of the helix at the outer edge of the flight and $S\,B$ its length at the inner edge of the flight. Dividing the line $S\,C$ (the width of the flight), into any convenient number of parts, $A\,J$, $A\,I$, $A\,H$, etc., will represent the circumferences of circles concentric to $A\,S$ and within $A\,C$, and $J\,B$, $I\,B$, $H\,B$, etc., will represent the lengths of the corresponding helices. Lines drawn from A perpendicular to the lines $S\,B$, $J\,B$, etc., will intersect the latter at the points S', J', I', etc. Let $S'\,B$ equal the thickness of the metal at the inner edge of the conveyor flight. Then $J'\,B$, $I'\,B$, $H'\,B$, etc. will represent the thickness of the metal at the points where the helices $J\,B$, $I\,B$, $H\,B$, etc. are taken. Assuming now the thickness of the inner edge of the spiral which it is desired to produce to be 1-8 inch, for instance, the dimension $S'\,B$ will be scaled to such thickness, and the dimensions $J'\,B$, $I'\,B$, etc. will be then read by the same scale. By using thicknesses thus found the cross section of the spiral may be delineated as shown in Fig. 3, and the necessary contour of the rolls be readily determined therefrom.

The pass between the rolls as indicated by Fig. 4 corresponds to the cross section obtained by the above construction. The rolls being turned to the proper contour, it is next necessary to determine at what point on the cone the strip shall be fed in, as it is, of course, necessary that the rolls should draw the material between them at a ratio equal to the proportions between the different parts of the flight. In other words, the diameter of the cone at the point where it comes in contact with the inner edge of the spiral must bear the same ratio to the diameter of the cone where it comes in contact with the edge of the flight, as the lengths of the inner and outer edges of the flight bear to each other.

If this ratio were not observed, it would be impossible to force the metal through the rolls.

The proper ratio is usually determined by bearing in mind that the ratio of motion between two points, a certain distance apart, on the face of the cone varies in proportion to the distance away from the intersection of the axes of the cones, so that the further away from the intersection of the axis of the cones the strip is fed in, the smaller will be the ratio of motion between two points on the face of the cone.

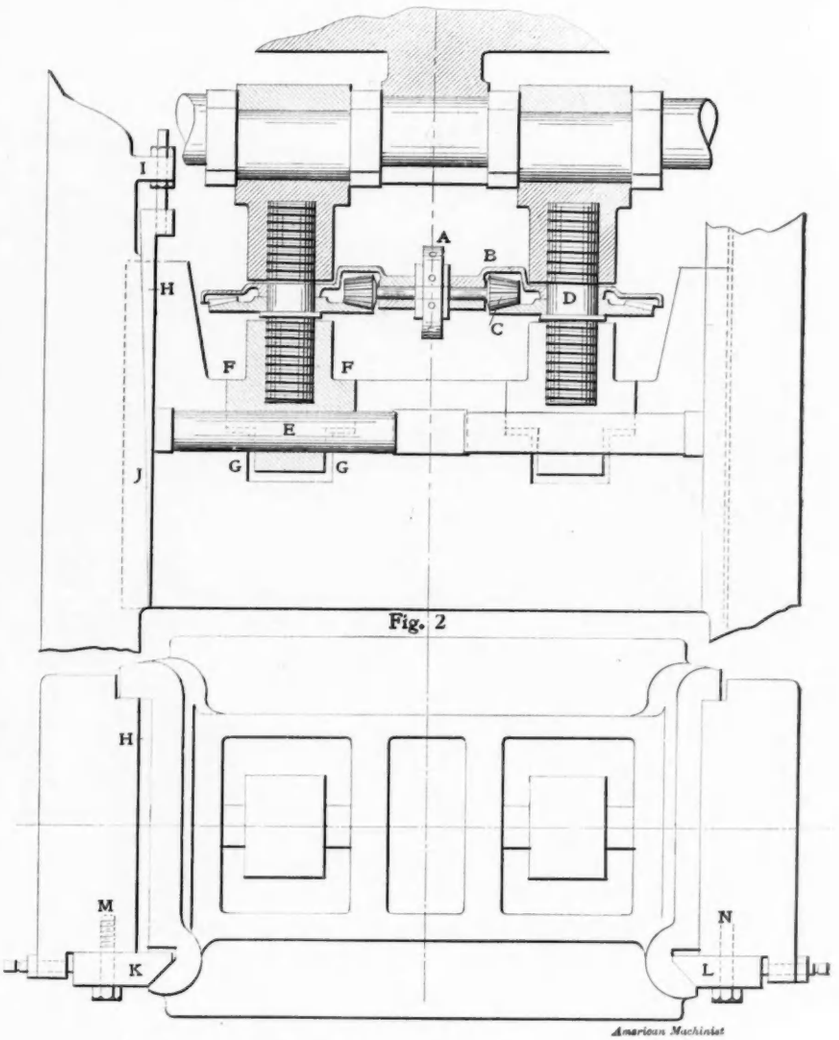


Fig. 2

FIG. 3. THE ADJUSTMENTS OF THE PRESS.

It is necessary, of course, to direct the metal as it issues from the rolls into either a right or left hand helix—this being done by guides of proper shape on the exit side of the rolls. The strip is fed into the rolls by means of guides which direct the strip to the proper position on the cones.

The conveyors have been made as small as 3 inches, external diameter, with the central core 1 inch diameter, and as large as 12 inches with a core of 3½ inches diameter. Strips as thick as ⅜ inch have been worked. Ordinarily the pitch of the

screw is equal to the outside diameter of the helicoid, but this is merely a matter of convenience, as the pitch may be made as small as will permit the helicoid to issue from the rolls without coming in contact with them and as long as desired.

Probably the most difficult spiral that has been made by this process is one of 9½ inches diameter with a core 2 inches in diameter, the metal before rolling being 3¼ inches wide and about 3-16 inch thick, and it will be seen that the change from the rectangular strip of the dimensions given to the helicoid indicated, is somewhat remarkable. There is no limit to the length of the spirals, although they are usually made in sections from 8 to 12 feet long.

One of the requirements of this article of manufacture is that the helicoid must fit the central shaft tightly, without any space between the shaft and the spiral itself, and it is further necessary that the pitch of the spiral shall be practically uniform. These conditions are met without difficulty in practice.

Fig. 5 shows the machine complete and in operation with a conveyor issuing from its rolls. The rolls will be seen to be driven from above and to stand directly in front of the furnace in which the material is heated. Some idea of the extent to which the conveyors are made may be gathered from the stock pile in the background. The machine upon examination and when seen in operation is extremely simple in appearance, but a little thought given to the processes of reasoning which were necessary to produce the result will no doubt suggest that the simplicity of the operation is one of appearance only.

A Large Perforating Press.

The half-tone, Fig. 1, shows a large and very powerful press designed for cutting and perforating blanks for transformer plates for electrical work, and for other classes of work where it is desirable to make all the perforations simultaneously with the cutting of the blank. An essential feature of such a press is in the side bearings, which must be long and rigid, insuring the closest fitting of punches and dies, which are of course expensive.

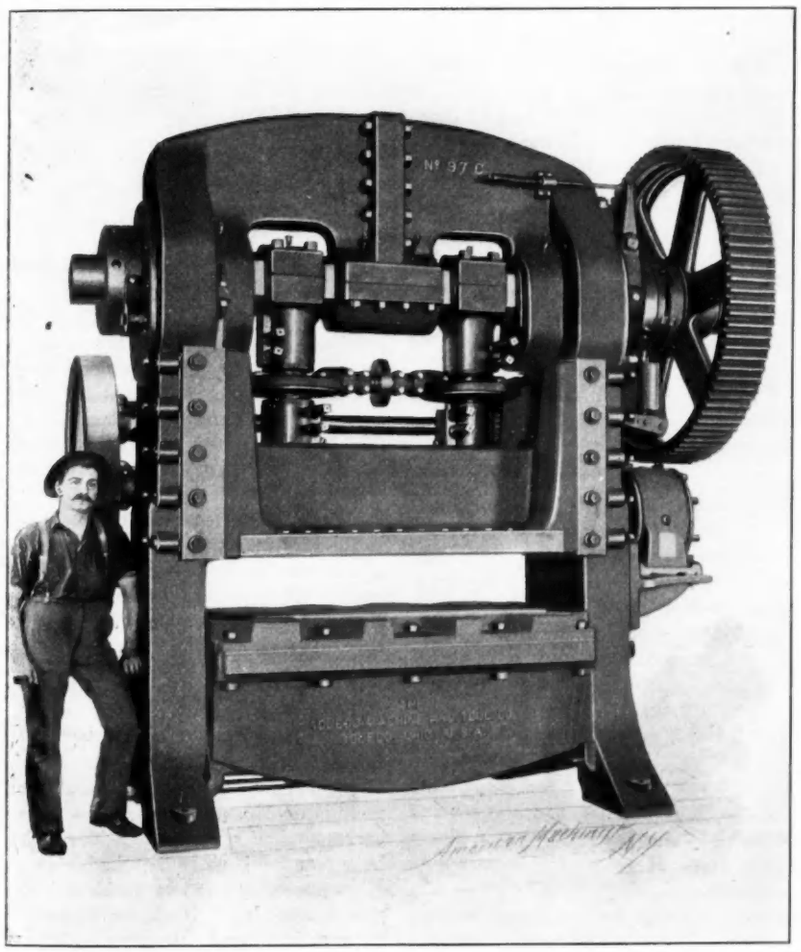


FIG. 1. A LARGE PERFORATING PRESS.

Referring to Figs. 2 and 3, it will be seen that the front and rear bearings of the slide are a considerable distance apart, and the bearings on both sides of the slide are entirely across the slide surface. The lateral wear of the slide is taken up by the broad vertical phosphor-bronze wedge *H*, which is adjusted by the long stud with nuts both above and below the lug *I* projecting from the housing. The wear on the front and rear bearings is taken up by the adjustable gibs *K* and *L*. The bevel faces of these gibs act to draw the slide forward, so that the lips of it will have a perfect bearing at the back. Great bearing surface is thus secured in both directions, and a stiff ram is provided on which to clamp the cutting punches or dies.

The vertical adjustment of the slide is by means of the cross shaft with a bevel pinion on each end working into bevel gears on the right and left screws of the two pitmans. The disk *A* on the middle of the shaft has holes for a bar, by which it is turned. This arrangement permits an adjustment of 3 inches with at no time more than 1½ inches of either screw exposed, and with no possibility of getting the slide out of alinement.

Another noticeable feature of the press is in the cutting away of the pitmans on the under side at *G G*, so that when the thrust of the punch occurs, the shaft is supported by metal directly beneath, and most of the shearing strain is avoided.

The diameter of the crank shaft at the bearings, which are long and ample for the work, is 9 inches. The machine is geared 30 to 1, and is motor-driven, the gearing being all cut. A positive automatic clutch is provided. The frame of the machine, as will be seen, consists of but three pieces, the right and left housings and the bed. These are held securely together by open-hearth machinery steel studs with reamed fits.

The principal dimensions of the press are: Distance between housings, 72 inches; opening in bed, 30 inches front to back and 69 inches right to left; greatest distance from bed to slide, 17 inches; distance from bed to bottom of slide bearings, 15 inches; weight of machine, about 65,000 pounds; capacity of the press, about 600 tons pressure. The press is one of a complete line of this style built by the Toledo Machine & Tool Company, Toledo, Ohio.

Effect of Piston-opened Exhaust Ports in a Gas Engine.

Some time ago we received the following inquiry:

"In gas engines having a main exhaust at the end of the piston travel, such as the 'White & Middleton' and 'Fairbanks' have, what means are taken to prevent the escape of the explosive mixture at the end of the induction stroke and at the beginning of the compression stroke?"

A.—It is our custom where a question relates specifically to the machines of a given manufacturer to refer it to him, our idea being that no matter how easy it may seem to us to answer the question, the maker of the machine can usually do it better than anyone else, and besides, it is a courtesy that is due to him in any event, that he should be given an opportunity to

answer it in his own way. We asked the Fairbanks people to answer the question as to their engine, but have received no reply. We asked the White & Middleton Gas Engine Company to answer it as to their engine, and have received the following reply:

"Yours of the 6th received. We are not in the habit of answering questions to parties for mere curiosity, in reference to manufacture of our goods, and our advice to the party asking the questions through your columns would be to have him study natural philosophy, and after he becomes somewhat educated in this line, it would be a very easy matter for him to decide what takes place in the cylinder provided with a piston, no matter whether it be provided with ports or not.

"Yours truly,

"WHITE & MIDDLETON GAS ENGINE CO.

"CHAS. WHITE."

While this is a very informing letter as to some points, we felt that our correspondent was entitled to a more direct answer, and so asked Herbert L. Towle, an authority in such matters, to answer the question. His answer contains a number of points that a man might fail to get hold of, even though he should study natural philosophy for a long time, and in fact we know of some gas-engine makers that do not seem well informed on all the points referred to. Mr. Towle's reply is as follows:

"Regarding the query of your correspondent as to the means taken to prevent the escape of fresh mixture from an exhaust port at the end of the piston's travel, I will say that no such provision is made because none is needed. If the engine has a suction-lifted inlet valve, the pressure within the cylinder during the suction stroke must be less than that in the air pipe or mixing chamber by the amount necessary to open the valve against the spring. The pressure in the exhaust pipe, on the other hand, will at the end of the suction stroke be at least equal to that of the atmosphere, and may be a little more. Consequently, when the exhaust port is uncovered by the piston, the burnt gases in the port and pipe will tend to go back into the cylinder till the difference in pressure is equalized.

"If, on the contrary, the inlet valve is mechanically opened, there will still be a drop in pressure from the mouth of the suction-pipe to the valve, due to the velocity of the piston's suction; and this drop will be greater for a given engine as the piston speed is higher. In the former case, where a part of the drop in pressure is constant, it seems likely that more burnt gases would be sucked back when the engine is turning slowly, as in starting, because more time is then given the gases to flow through the port. When the inlet valve is cam-lifted, however, the contrary result will obtain, because the drop in pressure is proportionate to the square of the velocity of the sucked air. In either case the quantity of burnt gas drawn back is practically negligible.

"The above refers to stationary engines of ordinary design and piston speeds. In small and very high speed motors, such as those used in automobiles, the drop in pressure becomes so great that the full charge of mixture is not received till after the piston has started on its return stroke. Under such circumstances, both the cam-lifted inlet valve and the piston exhaust are impracticable, the former because its time of closure is suited to one speed only, and the latter because at high speeds it results in excessive dilution of the mixture by burnt gases."

An exchange says that "a Detroit business man says that dictating to a stenographer has ruined his spelling. He cannot write an ordinary letter now, he says, without making gross errors in orthography." Mark Twain once invented a scrap-book, and his commendation of it stated, among other things, that it was an economizer of profanity. "One of the most beautiful, highly educated and most refined young ladies in Hartford, daughter of an Episcopal clergyman, told me, with tears in her eyes, that since she had begun using my scrap-book she had not sworn a single oath."

MACHINERY, MACHINES, AND PARTS OF—	AUGUST— 1899 Number.	AUGUST— 1899 Dollars.	AUGUST— 1900 Number.	AUGUST— 1900 Dollars.	EIGHT MONTHS ENDING AUGUST— 1898 Number.	1898 Dollars.	1899 Number.	1899 Dollars.	1900 Number	1900 Dollars.
Cash Registers	....	67,184	1126	78,990	....	*	....	126,035	....	514,501
Electrical	....	230,009	...	550,146	....	1,439,743	....	1,828,048	....	3,590 419
Laundry Machines	....	28,878	....	39,575	....	*	....	60.686	....	345,768
Metal-working	....	635,549	....	473,489	....	3,552,110	....	4,495,665	....	4,712,225
Printing Presses, and parts of	....	78,945	....	163,924	....	528,755	....	597,894	....	885,596
Pumps and Pumping Machinery	....	326,360	....	156,931	....	1,428 029	....	2,051,199	....	1,976,527
Sewing Machines, and parts of	....	382,304	....	416,549	....	2,213,646	....	2,576,187	....	3,095,892
Shoe Machinery	....	92,624	....	94,115	....	617,025	....	605,457	....	780,065
Steam Engines, and parts of—										
Fire	....	.....	....	.....	6	6,328	3	13,713	7	7,380
Locomotive	107	1,412,432	16	168,944	424	3,844 917	363	3,636,792	329	3,481,407
Stationary	109	60,620	99	51,645	358	258,274	549	304,107	900	525,596
Boilers and parts of Engines	....	943,518	....	207,110	....	749,063	....	907,156	....	1,223,192
Typewriting Machines & parts of	....	211,101	....	216 616	....	1,387,545	....	1,890,038	....	1,820 907
All other Machinery, and parts of	....	1,700.419	....	1.844,620	....	10,074,135	....	12,796 910	....	15,694 889

* Included in "All other Machinery" prior to July, 1899.

OFFICIAL STATISTICS OF MACHINERY EXPORTS, INCLUDING AUGUST, 1900.

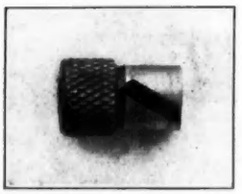
Letters from Practical Men

A Loose Jig Bushing with a Spiral Groove.

Editor American Machinist:

We enclose a bushing which shows a plan we have lately adopted for preventing loose bushings in drilling and boring jigs from turning while in use, which may be of interest to some of your readers. As you will see from the piece enclosed, a spiral groove is milled in the body of the bushing, into which engages the hardened end of a guide or stopping pin, which of course is stationary in the jig.

The spiral groove has many advantages over any other method the writer has ever seen in use, the principal ones being that



LOOSE JIG BUSHING WITH SPIRAL GROOVE.

the circular friction of the drill or boring bar seats the bushing always against the shoulder, even though the workman should neglect to do so. Also that the cuttings or chips cannot crowd the bushing out of the jig. This feature is specially useful in cases where the bushing must be inserted from the underside of a jig when used as a guide for a boring bar and, the spiral groove acting as a screw to assist in inserting or removing, allows a comparatively closer fit than can usually otherwise be employed, owing to the inconvenience of removing.

J. F. C.

Baltimore, Md.

A Strange Breakage.

Editor American Machinist:

The article, "A Strange Breakage," in your issue No. 39, is interesting, as your correspondent remarks, and it would have been more so if more data had been given. He suggests that it is a problem for theoretical men; but is it not rather a problem for practical men? He gives nothing from which the bending strain can be estimated, nor does he refer to it; but he says the break was a clean one, square with the shaft. This is one indication that it was not done by a twisting strain, and the position of the break, a short distance within the bearing, is an indication that it was caused by a bending strain. It may be too late now, but an inspection of the fracture by a practical man would settle the matter if it was only a twisting strain that broke the shaft. If the keys were able to transmit to the shaft the maximum safe load on the teeth of the gear, assuming that the gear is of cast iron, the skin stress in the shaft would be but 6,200 pounds per square inch. This would indicate that the

designer of the machine must have had some other strains to allow for; or, taking another view, the burr arising from the seizure in the bearing may have accumulated under the shaft and raised it together with one end of the cap, thereby bending the shaft. This also is a problem for a practical man. And still another view: If, owing to inaccurate boring of bearings, the shaft may have had to do the duty of a universal joint, the seizing in the bearing was the last straw that broke the camel's back. JOHN P. BLAND.

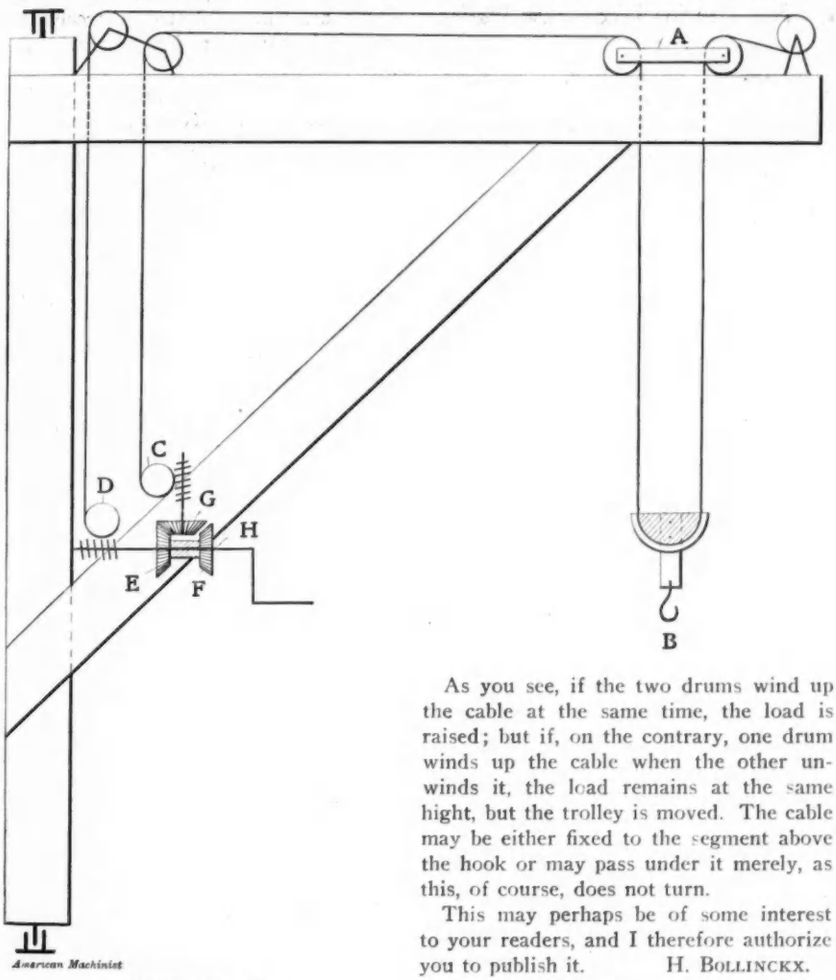
[It seems to us that the point of failure—well within the bearing, where, with decent fitting, the bending strain would be small—proves that the shaft could not have broken from the bending strain. In fact, had the bending strain been the cause of failure, the break should have been at the point of application of the load. In a machine tool the theory of want of alinement between the bearings sufficient to affect the strength of the shaft, is of course inadvisable.—Ed.]

A Foundry Crane.

Editor American Machinist:

I send you enclosed a sketch of a small crane which I am to erect in my foundry. The sketch will suffice to show the simplicity and the ease of working of the same. As I do not patent it, anyone may use it.

As you see, the crane is composed of a little trolley *A*, which may be traversed on the crane as usual. On this trolley is placed the cable, which carries the load at *B*. The cable is coiled around two drums *C* and *D* commanded by endless screws, which may turn both in the same direction, or each in different directions simultaneously by means of the gears *E, F, G*. Both turn at the same speed, which we realize by the double gear *E F*, made in one piece, and which may be slipped on the crank shaft and secured by the wedge *H*.



A FOUNDRY CRANE.

As you see, if the two drums wind up the cable at the same time, the load is raised; but if, on the contrary, one drum winds up the cable when the other unwinds it, the load remains at the same hight, but the trolley is moved. The cable may be either fixed to the segment above the hook or may pass under it merely, as this, of course, does not turn.

This may perhaps be of some interest to your readers, and I therefore authorize you to publish it. H. BOLLINCKX.

Brussels, Belgium.

Superintendent Wanted.

Editor American Machinist:

During the last six months we have had four superintendents at our shop, and, although they were all smart men, none of them seemed to fill the bill; so I thought perhaps some of your readers would like to try for the job.

The first one (Brown, we will call him) was a good fellow, a good draftsman and mechanic, and the boys liked him. He was quiet, but he had one fault—he was too narrow. He would go down to the foundry to see when a casting would be ready, instead of sending a man, and he would run his legs off rather than send a boy to do an errand; he couldn't seem to see that the boy's legs were cheaper than his (as well as shorter).

Well, then we had "Jones." He was a good fellow, too, I guess, but he seldom came out into the shop, and I never heard him give an order that was mechanical; that is, he did not know the technical names of tools, and if he could make a sketch, I never saw him do it. But he could systematize first rate. He got out some good time cards, a time clock and a pay-off system. Then he went off.

Then No. 3 came. He was a mechanic, had a nice set of tools, could tell a man how to do anything, and could do it himself if the man could not, and would do it, too, quite often; but he had two faults: He was too free with the men; would go in and take a glass with the foremen, and stand on the sidewalk and chin with the girls. He couldn't manage the office, but he had a lot of stick-to-it in him, and he could talk as strong as any man I ever saw; but 'twas no use—he had to go.

Then No. 4 appeared. (Never mind his name.) He was a hustler; he could cover more ground than any man I ever saw, and he was there early and late. He used to carry a big note-book and set down everything in it—"carried his brains in his fist," the boys used to say. Well, he got out more work to the square foot than Nos. 1, 2 and 3 put together. He was not a mechanic, but just a hustler. He would be around right after 7 and the last thing before 6 o'clock; but he never seemed to get the good-will of the men, and after he had been there two or three months he had a fuss with some of the directors, threw up his job and left us.

We don't know who the next man will be—someone who can run the place, we hope. A. P. PRESS.

Finding the Radius.

Editor American Machinist:

The formula given by Mr. Vogel in your issue No. 33 is simply the same rule as that given more than half a century ago in Nesbitt's "Mensuration." That rule set forth that in order to find the diameter of the circle from any arc, we must "divide the square of half the chord by the hight, and add the hight." Thus if a be the hight of the arc and b the half chord, then

$$\text{Diameter} = a + \frac{b^2}{a}$$

$$\text{Radius} = \frac{a + \frac{b^2}{a}}{2}$$

$$= \frac{a}{2} + \frac{b^2}{2a}$$

$$= \frac{a^2}{2a} + \frac{b^2}{2a}$$

$$= \frac{a^2 + b^2}{2a}$$

which is Mr. Vogel's formula.

That the formula is absolutely sound may be proved trigonometrically, thus:

If the radius = 1, then it is evident that $a = 1 - \cos. A$, and $b = \sin. A$; therefore if

$$\text{Radius} = \frac{a^2 + b^2}{2a}$$

then $$1 = \frac{(1 - \cos. A)^2 + \sin.^2 A}{2(1 - \cos. A)}$$

$$= \frac{1 - 2\cos. A + \cos.^2 A + \sin.^2 A}{2 - 2\cos. A}$$

But $\cos.^2 A + \sin.^2 A = 1$, whence, by substitution and addition, we get

$$1 = \frac{2 - 2\cos. A}{2 - 2\cos. A}$$

$$\therefore \quad 1 = 1$$

which is evidently incontrovertible.

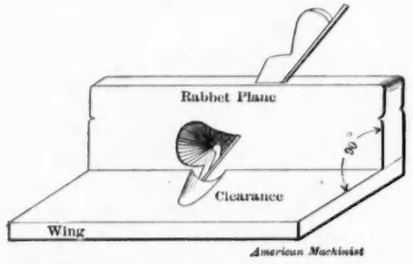
H. W. HALBAUM.

Gateshead-on-Tyne, England.

A Core-box Plane for Small Boxes.

Editor American Machinist:

The core-box plane to be described is used for planing out semicircular core boxes and is made by adding a wing to a common 1-inch rabbet plane, as shown in the sketch. This wing may be fastened permanently to the plane, or, better yet, two screws and dowel pins may be used to fasten and keep it in place. This last way allows the plane to be used as an ordinary rabbet, as the wing can be removed or put back in place whenever required. The wing should be square with the outside of the plane, and gouged away on the inside as shown, so that the shavings will have plenty of clearance.



PLANE FOR SEMICIRCULAR CORE BOXES.

The plane iron is ground, sharpened and set in the usual way, but care must be taken to get the side of the iron and the outside of the plane exactly flush at the cutting corner. The box to be worked is roughed out in the usual way, and a thin strip is bradded to the face of, and exactly to one of the lines that mark the width of the box. Rabbet down about 3-32 inch, using this strip as a guide; reverse the strip to the other side of the box and make another rabbet like the first. The strip is then removed and the planing or rabbeting is continued, the corners of the box acting as a guide for the plane to swing on.

This same *modus operandi* is pursued in making tapered boxes, a tapered box being made much quicker and better with this plane than with any other tool known to the pattern-making craft. HOBO.

Erasing Pencil Lines from Tracings with Gasoline or Benzine.

Editor American Machinist:

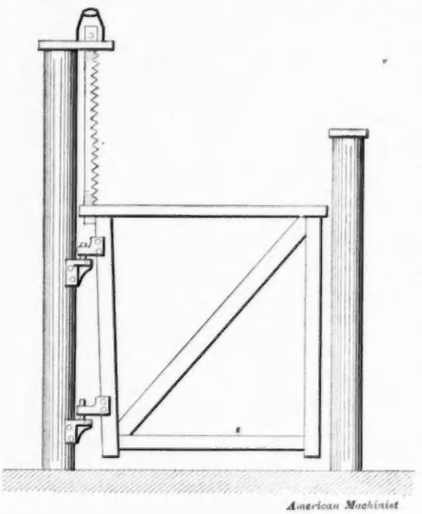
The following will, I think, be of interest and value to draftsmen who do not know of it, and I find a great many who do not:

A rag moistened with gasoline or benzine will remove all lead pencil lines, either red, blue or black, from tracing cloth, without in any way injuring the cloth or ink marks, and will not, as will a sponge rubber, make the ink lines print poorly. CHAS. THISTLEWAITE.

A New Use for Wood-Saw Blades.

Editor American Machinist:

The display of mechanical ingenuity when one has at his command the contents of a hardware store or some other source of supply may interest us considerably;



A NOVEL GATE SPRING.

but when one has nothing but his wits and a scrap-heap to draw upon, his ingenious productions are bound to command our admiration.

The older readers of the "American Machinist" will perhaps remember the pleasure Chordal had, in one of his interesting letters, in relating the discovery of a man, back in the country without the necessary tools to bore out a badly worn engine cylinder. Rather than be stuck in this necessary work, he utilized a grate bar for a boring bar. That man was a true genius.

I have a friend, retired from business, and with a country place on Long Island. He is one who enjoys finding ways and means right at hand to accomplish his requirements, and his latest accomplishment pleased me so much I am tempted to offer it to the readers of the "American Machinist."

Dividing the chicken yard, stable grounds, etc., from the lawn in front of the house, is a fence made of wire netting. A gate in this fence passes the employees between the house and stable. These employees, as well as the dog, would persist in swinging the gate too far, so that it would not close, and the chickens—ever ready to improve such an opportunity—would take possession of the lawn and find their most palatable food at the roots of the choicest flowers in the flower beds.

My friend's ingenuity was at once challenged, and at last he remembered certain old blades belonging to a hand wood saw, which had been lying in one of the old corn cribs ever since he bought the place.

It was but a question of a day or two before they were rigged as shown in the accompanying sketch.

A piece of hardwood board was nailed on to the top of the gate post carrying the hinges, after being slotted to receive the saws (a loose fit), and after receiving a strap around its edges, made of the iron hoop of an old pail, to prevent splitting.

A similar slot (to receive the saws) and an iron strap were arranged at the top of the gate in the top rail, as shown in sketch. The long saw blades were then brought out, and first one, then two, and finally three were dropped in place, being held by a wire pin at the upper end, through the hole provided to hold them in position in the saw frame.

When the proper number of blades were in place (allowing the dog to push his way through without trouble), they were fastened together, top and bottom, by wire wound around them, and thus a perfect gate spring was produced, but as a semi-protection from the rain an old glass was inverted over the upper exposed ends of the blades. Now the family have to walk to the fence whenever they wish to see their chickens, and their flowers and plants are prospering finely. A. A. CARY.

"Machinist No. 3."

Editor American Machinist:

The article "Machine Shop Poetry," in the "American Machinist," No. 41, reminds me of some verses that I perpetrated when third engineer of the S. S. "Maple Branch." I had had but six months' sea experience in another boat and was decidedly green. The chief engineer, Mr. Morrison, was a north country Englishman, from Shields, and was a man of wide experience as a marine engineer, but had a mania for enigmas, acrostics and rhymes. The minor orders on the log slate were almost invariably in the form of riddles; the important ones written in verse.

We had been out about a week, when the condenser tubes began to give out; the boilers consequently made water very rapidly. One night as I went on watch at 12 midnight he said, "Can you blow the boilers down?" "Why, certainly I can." "Well, if she doesn't leak quite up to three-quarters glass you can pump her up at 2 A. M. and blow her down to one-quarter glass. Good night." He was evidently not as confident of my ability as I was, for he had not been out of the engine-

room more than ten minutes before he returned and said, "You had better call me at 2 o'clock; I am afraid you might make some mistake." "All right, sir," I replied, and off he went.

As I walked up and down the platform, between oiling times, it struck me that it would be a good idea to give him a line or two of rhyme about this blowing-down business; so I cleaned the log slate and wrote as follows:

It was the good ship "Maple Branch"
That sailed the stormy sea,
And she had on board a silly fool,
Machinist No. 3.

Said the chief one night to this silly fool,
"You're not worth half-a-crown,
If you can't pump those boilers up
And blow those boilers down."

And now in Shields a widow mourns
And drinks of sorrow's cup,
For the silly fool he pumped them down,
And he blew those boilers up.

I called the chief promptly at 2 A. M. As he came down the engine-room stair the log slate was directly in front of him, and he stepped over to read the verses. It had just struck him right; for, after reading, he turned to me and said: "Go ahead and blow her down yourself. Man, you're a fine rhymster." E. A. SUVERKROP.

Personal.

Thomas E. Jeffery, of the bicycle manufacturing firm, Gormully & Jeffery, Chicago, and whose partner died recently, intends to retire from business.

G. M. Basford, editor of the "American Engineer," gave an address before the engineering students of Purdue University, October 17, on the subject of "After Graduation, What Next?"

S. A. Linton, formerly of the Pratt & Whitney Company, has purchased the shop and business of the Ideal Machine Works, Hartford, Conn., which he will carry on under that name.

N. G. Cairns, who was formerly assistant foreman for the Eddy Electric Company at Windsor, Conn., is now toolmaker for the Woods Automobile Company, Wabash and Twentieth streets, Chicago.

The firm of Godfrey & Gilbert, machinists, of Ithaca, N. Y., has been dissolved. Mr. Godfrey continues the business. Mr. Gilbert, who retires owing to failing health, expects to leave next month for his old home in England.

Our correspondent, C. H. Rowe, who contributed to last week's issue the article entitled "A Punch and Die for Reducing Brass Tubing," wished us to say that it was he who contributed the articles of a similar nature previously published over the signature of "Die Maker."

C. B. White, who was formerly connected with the engineering department of the old Edison Electric Company, who was later superintendent in charge of construction work with the Calumet Electric Street Railway Company, Chicago, and who for the past two years has been with the Western Electric Company, has taken charge of a new office opened in the Security Building, St. Louis, by the Sprague Electric Company, New York.

Obituary.

The many friends of Mr. Frank Kempsmith, of Milwaukee, will be sorry to learn of the death of his son, Milton, who was nearly ten years old, and was killed by the cars in Milwaukee, September 30.

Cornell University commences the year with nearly three thousand students in all departments—professional schools included. The department of mechanical engineering registers 638 undergraduates with a considerable number of graduate students.

Manufacturers.

It is reported that A. L. Chandler, Westfield, Me., will build a new mill.

David Gross, Berlin, Ont., has bought a site there on which will be erected a factory.

Loton J. Cannon, Hyannis, Barnstable, Mass., is having an addition built to his factory.

Unprecedented development is now in progress in various mining camps of Boulder County, Colo.

Carl Browne, of Coxey-army fame, is to build a flying machine factory near Fulton P. O., Kansas.

An addition, 18x52 feet, is to be built to the machine shop of Walter Pearson & Co., Whitman, Mass.

The New England Box Company, of Boston, Mass., and Winchester, N. H., is building at the latter place.

The Tennessee Fixture & Show Case Company, Chattanooga, Tenn., is building a factory at Park Place.

Big improvements are under way at the Mishawaka Woolen Manufacturing Company's works, Mishawaka, Ind.

The Perfection Fixture Company, Flint, Mich., will erect a two-and-a-half story brick factory building, 50x100 feet.

It is rumored that the Carnegie interests will erect a large steel plant adjoining the Ford glass works, at Toledo, O.

The District of Columbia Paper Manufacturing Company, Water street, Georgetown, has decided to enlarge its plant.

L. D. West, Dundee, N. Y., and another have leased a factory in Geneva, N. Y., and will manufacture the West fuel saver.

A permit has been granted to M. Osmer for a four-story brick factory at 30-33 Elston avenue, Chicago, Ill., to cost $20,000.

The Duerr Contracting Company, which operates a stone-crushing plant northeast of Le Roy, N. Y., will enlarge its plant.

An addition will be built to the canning factory of F. H. Hayes, on Water street, Dexter, Me., and considerable machinery put in.

The Cumberland Hydraulic Cement & Manufacturing Company, Cumberland, Md., is erecting a new mill on the site of the old one.

The Plant of the Faries Manufacturing Company, manufacturer of check rowers and

(Continued on page 42.)

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 20.

Dies & punches. Amer. Hdw. Co., Ottawa, Ill.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Gas engine castings. Box 181, Springfield, Mass.

For Sale—4 H.-P. and 2 H.-P. gas engines. Box 1171 Springfield, Mass.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, Pa., build light machinery.

"Brandt's Triple Expansion Gaskets" are the best for boilers. Randolph Brandt, 38 Cortlandt st., New York.

Wanted—Catalogs and other descriptive matter and prices of accident-prevention devices for use in workshops. Address G. W. Lissell, Ames, Iowa.

Threads and gears; easy rules to cut any thread possible to be cut in the lathe, without algebra, sent to any address for 25c. (postal order) by G. W. Dixon, Spring Lake, Mich.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Draftsman and designer; Swedish technical school; new plant work preferred. Box 15, AMERICAN MACHINIST.

Situation as foreman in Brass shop; 20 years' experience; good reference given. Address A. P. Deignan, Lake Geneva, Wis.

All-round machinist and toolmaker with technical education, can handle men successfully, desires position, shop or traveling. Address F. V., AMERICAN MACHINIST.

Position as chief draftsman on machinery wanted by young mechanical engineer, with 4 years' experience as draftsman. Address "Ability," care AMERICAN MACHINIST.

Position as superintendent in plant manufacturing light interchangeable metal work; 20 years' experience brass work, sewing machines and bicycles. Box 348, AMER. MACH.

Mechanical engineer with years of practical experience in steam plant, mill construction and crushing-plant machinery; a position of responsibility is solicited. S. C., AM. M.

Successful foreman of long experience, thoroughly posted in the manufacture of steam engines, would like to correspond with parties looking for a hustler. Box 18, AM. M.

Engineer desires position of responsibility as mechanical superintendent, chief draftsman, or charge of construction; good designer and executive ability; member A. S. M. E. Address Box 17, AMERICAN MACHINIST.

An experienced mechanical and electrical engineer who desires to make a change would like to hear from large manufacturing establishment wishing to employ a competent man to take charge of power-plant machinery, etc. Address Box 14, AMERICAN MACHINIST.

Practical mechanical engineer and draftsman, with 6 years' experience in modern shops and drawing rooms, desires a change; 2 years with manufacturing company employing 6,000 to 7,500 men; technical education; age 30; American; prefer Central States. Box 3, A. M.

Practical superintendent with technical education, capable of organizing or reorganizing a machine plant according to the very latest methods, aggressive and plenty of

(*Continued from page* 41.)

wire, Decatur, Ill., recently burned, will be rebuilt.

Stock subscription books for a new wire mill company have been opened at the office of C. D. Voris, on South Green street, Crawfordville, Ind.

The Aiken-Gleason Company, Seventh and La Crosse streets, La Crosse, Wis., will probably build a large factory addition for the manufacture of cameras.

The Pennsylvania Railroad Company will, it is stated, add 150 feet to its Juniata boiler shops and equip it with the latest and heaviest machinery and appliances.

L. F. Wittebort, of Hartford City, Ind., has contracted to erect a factory at Bluffton, Ind., the output to be window and flint pots, flattening stones and similar work.

The building of another addition to the works, at Dauphin, Pa., of the Dauphin Bridge & Construction Company, Philadelphia, Pa., is under contemplation.

A permit has been granted to Edward E. Stanchfield for a brick and stone foundry building, Delgany street, between Fourteenth and Fifteenth streets, Denver, Colo.

A building permit has been issued to the Carnegie Steel Company, for a one-story brick shop on Thirty-third street, Fifteenth ward, Pittsburgh, Pa., to cost $18,500.

H. H. Lang, of the Hercules Specialty Company, Sharon, Pa., has bought the Keystone Shoe Company's factory building at Erie and will manufacture specialty goods there.

The plant of the Apple River Power Company, of New Richmond, Wis., is to be enlarged by the erection of a mill, with machines driven by independent electric motors.

The National Glass Company at its June meeting set aside $150,000 for enlarging its plants, and it expects to devote a large percentage of this to the plant at Marion, Ind.

The Reading Scale & Machine Company, Ltd., Reading, Pa., will erect a new plant, to consist of a three-story machine shop, a commodious foundry and a boiler shop, all separate.

The middle Georgia cotton mills, at Eatonton, Ga., have contracted with J. W. McMillan & Son, of Milledgeville, for the erection of a plant. A 500 horse-power engine will be put in.

J. E. Dayton Company, whose shoe factory at Williamsport, Pa., was recently destroyed by fire, will erect a new six-story building on the old site. They will put in up-to-date machinery.

F. N. Nichols, of Sears & Nichols, Chillicothe, Ohio., was in Port Huron, Mich., recently, looking up a site for a canning factory, which it is said would employ 400 to 600 people.

The Michigan Heater Company, Detroit and Big Rapids, Mich., will erect a foundry. The main building will be 100x128 feet, one story high, and there will be a two-story building, 48x100 feet.

The Huntley Manufacturing Company, maker of grain cleaning and buckwheat machinery, Silver Creek, N. Y., has broken ground for an addition to its factory, 63x34 feet, two stories.

(*Continued on page* 43.)

WORK WANTED.

A hardware specialty factory with some surplus capacity wishes to manufacture a good patented article that can be sold in large quantities. Answer with full particulars to

Box 357, AMERICAN MACHINIST.

Situations Wanted—Cont'd.

executive ability in carrying out plans, at present in charge of 350 men on engines, pumps and all kinds of power-plant machinery, will be open for engagement December 1. Parties requiring a general superintendent, please address Box 337, AMER. MACHINIST.

Help Wanted.

Good machinist, thoroughly experienced in construction of machine tools. Niagara Machine & Tool Works, Buffalo, N. Y.

Mechanical draftsman, with experience in designing small motors and electrical instruments. Box 22, AMERICAN MACHINIST.

Draftsmen desiring extra money, state where employed, confidential. Edwin Guthrie, Corcoran Building, Washington, D. C.

Wanted—Several mechanical draftsmen. Address C. M. H., care AMERICAN MACHINIST, giving references, experience and salary expected.

Wanted—Designer and draftsman on punch presses and sheet-metal tools; permanent situation at a good salary for the right man. Address "Stamping Presses," care AM. MACH.

Wanted—Foreman to take charge of 15 to 20 machinists; only first-class man need apply. Give age, experience, references and wages expected to Box 20, AMER. MACHINIST.

Foreman wanted for machine shop in New England, employing 25 men; work is general machinery and repairing; only first-class, experienced foreman wanted. Address A., care AMERICAN MACHINIST.

Wanted—A strictly first-class mechanical and steam engineer of tested ability and experience, thoroughly up in his profession; substantial salary and permanent position. Address, confidentially, Box 21, AM. MACH.

Wanted—Foreman machinist for Canada; must be practical and up to date and get out work rapidly; to take charge of 30 to 40 hands. Address, stating age, experience and wages expected, Box 8, AMERICAN MACHINIST.

Wanted—Blacksmith foreman over five fires for shop in Western Pennsylvania manufacturing engines and general forging on both anvil and steam hammer; give reference, age, experience and wages expected. Box 19, A. M.

WANTED.

SUPERINTENDENT for large motor vehicle shop. Man of long experience and known reputation as a successful manufacturer.

CHIEF DRAUGHTSMAN—Man capable of designing machinery. Must have had shop experience, and have had a similar experience elsewhere.

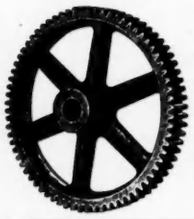
FOREMAN for Machine Shop.

FOREMAN for Pattern Shop.

The shops of the company are located in Philadelphia. Send full particulars as to ability, character and references. State position held and experience. Please do not apply unless you know you are eminently suited to fill the place.

Address Box 13, AMERICAN MACHINIST.

Bevel Gears with Planed Teeth



we make as few specialists in gear cutting can make them. Special machinery and specially trained, skillful workmen produce gears of special accuracy, and very often at special, low prices.

Get Gear Book "K."

Boston Gear Works,

Pearl and Purchase Sts., BOSTON, MASS.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

A shop making 300 small automatic cut-off engines a year is looking for a superintendent capable of taking full charge of the manufacturing, with a view of increasing their output and sizes; a good opportunity for an up-to-date man. Address Box 366, AMER. MACH.

Wanted—Superintendent of machine shop employing 50 men; man having knowledge of electric work preferred. Address Box 23, AMERICAN MACHINIST, stating experience in handling men, devising means for getting out work quickly, giving references and salary wanted.

Iron foundry foreman; one who can take charge of 75 men and produce results; must be familiar with green and dry sand core work, heavy and light valve castings; state age, married or single and salary wanted; excellent situation to the right man. Box 16, AMERICAN MACHINIST.

Wanted—25 good vise hands on light machine work; only good, steady men need apply; to such, good pay and permanent positions are offered; state age, wages now received, where you have been employed, whether single or married. American Machine & Foundry Co., Hanover, Pa.

Mechanical engineer, for head of drafting office in a factory building stationary and marine engines, boilers, sawmill, pulp and general machinery; 400 employees; a graduate of technical school with at least 10 years' experience; this is a good opening for a bright, thoroughly up-to-date man. Box 367, AMERICAN MACHINIST.

Rawhide Pinions

should be cut on the Fellows Gear Shaper, because no other way will produce equally accurate and finely finished pinions so quickly and economically. If you think that's too general a statement, we shall be glad to make it more specific on request

The Fellows Gear Shaper Co.,

SPRINGFIELD, VERMONT.

Machinery

for reducing and pointing wire. Specially adapted to pointing wire rods and wire for drawing.

For machines or information address the manufacturer,

S. W. GOODYEAR, Waterbury, Conn.

CLEVELAND GEAR WORKS,

W. R. SAWYER, Lessee.

86 SENECA STREET, CLEVELAND, O.

GEARS of all descriptions.

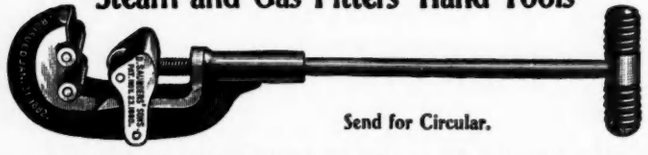
D. Saunders' Sons ....

Steam and Gas Fitters' Hand Tools

24 Atherton St., Yonkers, N. Y.

Manufacturers of

Pipe-Cutting, Threading and Tapping Machines.



Send for Circular.

The Patent Wheel Pipe Cutter shown in the cut combines simplicity with strength and lightness. Easily adapted to various sizes of pipe. Rolling instead of sliding motion. No loose parts to become detached and mislaid. All wearing surfaces are of tool steel hardened. Less friction of parts than any other pipe cutter made.